DEFENSE INDUSTRY BULLETIN

Vol. 4 No. 7 July 1968

Hall of Heroes—The Pentagon

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DEPARTMENTS

The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Editor. Telephone queries: (202) OXford 5-2709.

The *Bulletin* is distributed without charge each month to representatives of industry and agencies of the Department of Defense, Army, Navy and Air Force. Subscription requests should be made in writing on letterhead and addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301.

DEFENSE INDUSTRY BULLETIN

Published by the Department of Defense

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Subcontracting and Small Business

Clyde Bothmer

The Small Business Act places on all government procurement agencies and the Small Business Administration (SBA) the responsibility to insure that "a fair proportion of the total purchases and contracts or subcontracts for property and services for the Government" is placed with small business enterprises. The reference to subcontracts has become increasingly significant in recent years.

Between 1954 and 1961, the percentage of Defense Department contract awards in the United States received by small businesses dropped from 25.3 percent to 15.9 percent. Principal reasons for this change are varied, but can be deduced readily from the figures available. In 1952, defense spending was at a peak for the Korean conflict, at about $40 billion; by 1954, expenditures had declined to slightly more than $10 billion. Small business absorbed a portion of this reduction but retained about a quarter of the defense prime contract dollars as mentioned before, and as shown in Figure 1 on page 2. As the defense dollars increased after 1954, however, the dollar amount which went to small business remained fairly constant, and the share of small business in these government contracts diminished.

Several causes might be suggested for the static small business situation in these years, but two seem particularly significant: large firms were forced to compete for contracts usually within the small business sphere, in order to maximize plant utilization; and the increasing complexity of modern weaponry, combined with the trend to the procurement of total systems from a single prime contractor, tended to close the market to small businesses whose resources were inadequate for tasks of such magnitude.

It is to the latter problem that the subcontracting program required by Public Law 87-305, passed in September 1961, is directed. By this Act the Congress required the Small Business Administration, the Defense Department, and the General Services Administration to develop, jointly and cooperatively, a small business subcontracting program. By December of that year, the agencies reached agreement on 15 principles which were incorporated into the Armed Services Procurement Regulation (ASPR) and the Federal Procurement Regulations (FPR).

The ASPR provisions for the subcontracting program, applicable to all contracts except those to be performed entirely outside of the United States or for personal services, divide procurements into two groups: those ranging from $5,000 to $500,000, and those over $500,000. (Contracts under $5,000 do not offer significant opportunity for subcontracting). Contracts which fall into the first category include a "best efforts" clause; the contractor agrees to accomplish the maximum amount of subcontracting to small businesses that he "finds to be consistent with the efficient performance" of the contract. In procurements over $500,000, the contractor is required by a mandatory contract clause to undertake a full small business subcontracting program with the specific responsibility to:

- Designate a small business liaison officer.
- Give consideration to small business on "make or buy" decisions.
- Offer small business an equitable opportunity to compete for subcontracts.
- Maintain detailed records of subcontracts in excess of $10,000.
- Prepare and submit specific reports to the appropriate buying agency.
- Pass on similar responsibilities to major subcontractors.

These contractual requirements in themselves, however, were inadequate to assure enthusiastic participation in the program. Also, the regulations were being applied across the board in a general way, while the need was for selective effort in areas where a substantial return might be expected. Recognizing these needs, SBA and DOD jointly launched the Voluntary Subcontracting Program.

Clyde Bothmer is a Deputy Associate Administrator of the Small Business Administration. Before joining SBA in 1966, he was Executive Secretary of the Defense Industry Advisory Council of the Defense Department. He is a graduate of the University of Iowa and the Iowa College of Law.

The initial proposal of this program, which would be unrelated to prime contractors' legal obligations, was made by a joint letter from Administrator John E. Horne of the SBA and Assistant Secretary of Defense (Installations and Logistics) Thomas D. Morris. The letter was forwarded on May 3, 1963, to the 25 defense prime contractors who received the highest net value of the prime contract awards in FY 1962. All of the firms agreed to participate in the program. On Dec. 4, 1964, another letter was sent by Administrator Eugene P. Foley and Assistant Secretary Morris, inviting additional firms to participate. With recent additions, one firm at its own initiative, the total number of participants rose to 37 (there would have been 39 but for 2 mergers of member firms).

Under this program the prime contractor assumes the greatest portion of the responsibility. Members agree to:

- Identify commodities and services for which small businesses are not presently solicited.
- Provide to SBA the data necessary to develop new sources (*e.g.*, drawings, technical descriptions, specifications, etc.).
- Review specifications for revision, when feasible, so that small firms will not be excluded by unnecessarily restrictive requirements.
- Advise procuring agencies of specifications or contract provisions which appear to be unnecessarily restrictive.
- Advise small firms on procedures for acceptance for the Qualified Products List.

On the Government's part, SBA attempts to discover new small business sources for industry, conferring with prime contractors on needs, requirements and plans. Also, the Defense Department, through its contract administration offices, provides review of the contractor's policy and practice in this area, both to assure adherence to ASPR provisions regarding small business, and to encourage new ideas for the furtherance of the program.

Between 1964, the first full year of the Voluntary Program, and 1967, the small business share of the total of military subcontracts rose from 39.1 percent to 43.3 percent. This represents a growth of about 10.7 percent in four years. Also, the growth appears to be totally resultant from the Voluntary Subcontracting Program, which is made up of only 37 of approximately 600 firms that provide the base for these figures. Subcontracts let by members of the program show an increase in the small business share from 34.8 percent to 40.5 percent in the same period, a growth of about 16.4 percent. The small business share of subcontracts awarded by non-participants in the Voluntary Program increased less than 2 percent in the same period.

This success has given impetus to an effort to expand the program to cover 35 more of the largest of DOD prime contractors. An invitation letter, signed by Administrator Robert C. Moot and Assistant Secretary Morris, was sent out on March 14, 1968. This final round of invitations will complete the coverage of those members of the "Top 100" DOD contractors which are considered to offer substantial subcontracting potential. Since the Top 100 accounted for 65.5 percent of the total dollar value of military prime contracts over $10,000 in FY 1967, and all other large prime contractors (some 300 corporations) received only 14.2 percent of the total dollar value, any further extension of the Voluntary Program would be of dubious value. If the subcontracting program is to continue to show gains, therefore, the SBA must develop new approaches to the issue.

One means of enlarging the present efforts without excessive personnel requirements is to place an increasing reliance upon review of contractors' subcontracting programs, while disengaging SBA from active participation in those programs.

The Defense Department has implemented the subcontracting program in the ASPR, as discussed earlier, and retains responsibility for assuring that its prime contractors discharge their obligations under the subcontracting clauses as under any other element of the contracts. At the same time, SBA has the responsibility of obtaining information as to the methods and practices utilized by prime contractors, and to report to the Congress on the accomplishment of small business programs. In order to minimize the impact of these responsibilities on the prime contractors, SBA plans to participate with the Defense Department in reviews of contractors, utilizing mutual information to the greatest extent possible.

The review by SBA will be directed toward three purposes:

- To determine the extent of compliance with the prime contractor's contract obligations at a specific purchasing activity.
- To obtain information on the procurement methods and practices of the prime contractor, and the extent

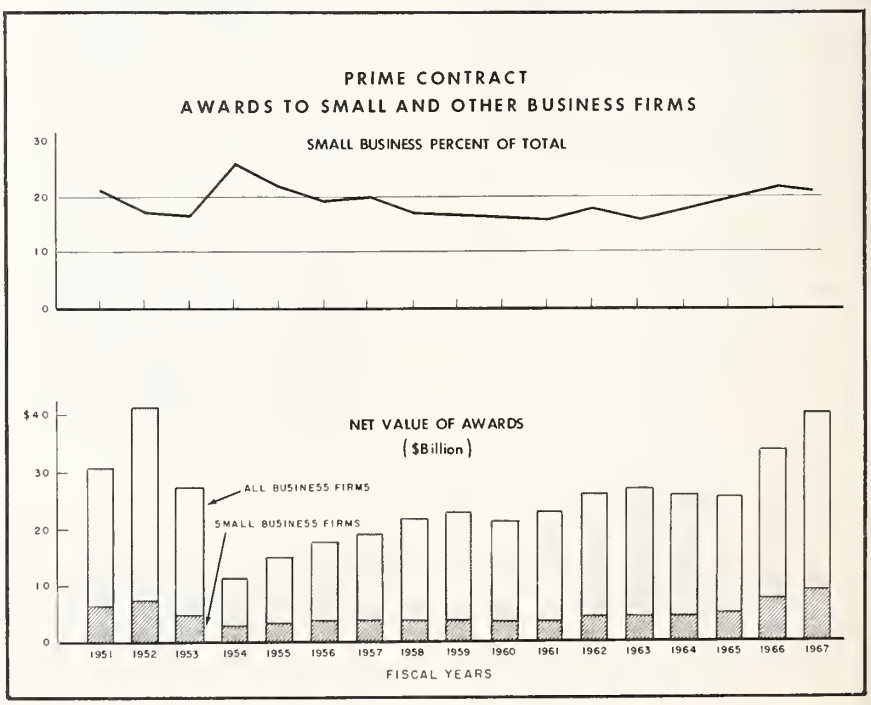

Figure 1.

U.S. Government

SMALL BUSINESS ADMINISTRATION

Washington, D. C.

April 9, 1968

Lt. Commander E. W. Bradford
Office of the Assistant Secretary
of Defense (Public Affairs)
Pentagon, Room 1E764
Washington, D. C. 20301

Dear Commander Bradford:

With this letter I am submitting the first of a series of articles which you may, pursuant to our discussions, wish to publish in the *Defense Industry Bulletin*. Each of these will deal with a specific aspect (program) of the Small Business Administration.

The subcontracting program has been selected as the first in the series because it is, perhaps, of the greatest interest to your "subscribers."

As you know, the program activities of the Small Business Administration are grouped into three major areas under three Associate Administrators for: Financial Assistance; Investment; and Procurement and Management Assistance. This series will deal only with the procurement assistance and management assistance areas and, in the order of their appearance, will include:

SBA's Subcontracting Program
SBA's Prime Contracting Program
SBA's Management Counseling Program
SBA's Management Training Program
SBA's Technology Utilization Program
SBA's Size Standards Program

Not so long ago, I heard a high-ranking government official express a philosophy which struck me as very significant. He made the point that a governmental agency has a positive duty to educate those segments of the populace potentially interested in its programs; for to fail to do so is to discriminate in favor of those with knowledge and against those without. SBA's programs are not as well known as we would like them to be, and we are, therefore, grateful to you for helping us carry out our duty to inform a segment of the public which is directly or indirectly involved in each of the programs to be described.

Sincerely yours,

CLYDE BOTHMER
Deputy Associate Administrator

of his subcontracting to small business.

- To evaluate the prime contractors' subcontracting programs so that the findings may be utilized by contracting officers in determining allowable profit in negotiated contracts.

In order to complete each review in a manner which will achieve its purposes, SBA has developed a set of questions for which the reviewing officer will seek answers. The questions are based on the requirements of the subcontracting clauses of the company's government contract and, in addition to obtaining desirable factual data, are directed toward determining whether the contractor has:

- Implemented a real small business subcontracting program, in fact as well as on paper.
- Committed himself to the program, giving attention to it at appropriate levels of management.
- Kept the program alive and known in the organization after initial establishment.
- Established procedural steps which assure opportunities for small business bidders.
- Developed plans and goals for maximum small business participation and capability for appraising progress.
- Declared and observed policies consistent with and supporting his obligations under the small business subcontracting clauses of the contracts.

At the conclusion of the review, a summary of the findings and recommendations will be provided to the contractor, and to the Defense Documentation Center. The material is then available to contracting officers who are developing weighted guidelines for profit on negotiated contracts. Small business subcontracting is a factor under "contractor performance."

Neither contract provisions and reviews, nor voluntary effort will be to any point, however, if there are no qualified small businesses bidding on contracts. To assure continued availability of such bidders and to increase their number, SBA is instituting "Project Upgrade." The purpose of Project Upgrade is to give interested small businessmen the opportunity to compete effectively for subcontracts within their manufacturing capabilities. This will be done by individual counseling, literature, management

courses, and jointly sponsored conferences. It will be the responsibility of the subcontracting specialist, in the SBA Area Office, to identify firms needing and desiring this service, identify problem areas, provide individual counseling, recommend individual counseling by regional team or SCORE, (SBA's Service Corps of Retired Executives which will be discussed in a subsequent article), and recommend the use of scheduled courses and conferences.

Candidates for this particular assistance program will be obtained in four ways:

- Prime contractors may advise small businesses, which fail to qualify as subcontract bidders, to seek assistance from SBA.
- Potential subcontractors will be identified by SBA personnel in the course of the Facilities Inventory Program (surveys to discover new, small business, industrial capability).
- Subcontracting specialists will recommend participation to businessmen contacted in the normal course of other duties.
- Regional Offices will refer potential subcontractors which appear in the regular course of assistance efforts administered at the Regional Office.

When a firm has been selected for assistance, the subcontracting specialist at the SBA Area Office will conduct a thorough analysis of the firm to determine deficiencies. Areas of study will include, as necessary, production, finance, facility, quality control, administration, management, sales and services. When the problem areas which prevent the firm's qualification as a subcontractor have been identified, the specialist will determine which SBA assistance programs will aid in the solution of the problems and he will supply or recommend that help, as appropriate. The specialist will provide to the cognizant Regional Office the names of firms, a statement of the assistance required, and a copy of his report analyzing company needs and recommended solutions.

When a firm has completed the recommended management training, conducted by Regional Offices, and has been provided counseling which is desirable, a report of the results, negative and positive, will be forwarded to the Area Office. There, the subcontracting specialist will be responsible to review the results and, where applicable:

- Determine the firm's area of capability.
- Refer the firm to prime contractors who have a current or future need for the product or service being supplied by the firm.
- Supply the firm with names of appropriate people to contact in sales efforts.
- Assure that the firm's capabilities are made known to Facilities Inventory personnel.
- Suggest that the small firm request the prime contractor, which previously rejected the firm, to reconsider the company as a subcontractor.

Project Upgrade will broaden the small business base from which prime contractors may select. Their responsibilities under the Voluntary Program and under their contracts should be lighter if the number of qualified small business bidders is increased. The SBA, on the other hand, will be able to place its emphasis upon direct assistance to small businesses, utilizing currently operational services, instead of the circuitous means which constituted the primary approach previously. Review will continue to be necessary but it will be oriented to observation and cooperative assistance rather than to an audit function.

The subcontracting program, as applied through the efforts described herein, should contribute significantly to achieving the goals of the Congress described early in this article. Additional benefits will be realized as well, by the nation as a whole, since this same program serves to introduce cost-reducing competition of defense contracts; to expand the base of the country's defense-production capability; and, by improving the performance and opportunity of small businesses, to strengthen the national economy.

Small Business Administration

Listing of Area and Regional Offices

NORTHEASTERN AREA
Boston, Mass. 02203
John Fitzgerald Kennedy Federal Bldg.
Government Center

Augusta, Me. 04330
Federal Bldg., U. S. Post Office
40 Western Ave.

Boston, Mass. 02203
John Fitzgerald Kennedy Federal Bldg.
Government Center

Concord, N. H. 03301
55 Pleasant St.

Hartford, Conn. 06103
Federal Office Bldg.
450 Main St.

Montpelier, Vt. 05601
Federal Bldg.
87 State St.

Providence, R. I. 02903
Smith Bldg.
57 Eddy St.

NEW YORK AREA
New York, N. Y. 10006
61 Broadway

Hato Rey, P. R. 00919
255 Ponce De Leon Ave.
P. O. Box 1915

New York, N. Y. 10004
42 Broadway

Newark, N.J. 07102
970 Broad St.

Syracuse, N. Y. 13202
Hunter Plaza, Fayette & Salina Sts.

MIDDLE ATLANTIC AREA
Bala Cynwyd, Pa. 19004
1 Decker Square

Baltimore, Md. 21201
Federal Bldg.
31 Hopkins Plaza

Clarksburg, W. Va. 26301
Lowndes Bank Bldg.
119 N. 3rd St.

Cleveland, Ohio 44113
Standard Bldg.
1370 Ontario St.

Columbus, Ohio 43215
Beacon Bldg.
50 W. Gay St.

Louisville, Ky. 40202
Commonwealth Bldg.
Fourth & Broadway

Philadelphia, Pa. 19107
1317 Filbert St.

Pittsburgh, Pa. 15222
Federal Bldg.
1000 Liberty Ave.

Richmond, Va. 23226
1904 Byrd Ave.
P. O. Box 8565

Washington, D. C. 20417
1321 H St. NW

SOUTHEASTERN AREA
Atlanta, Ga. 30309
1401 Peachtree St. NE

Atlanta, Ga. 30303
52 Fairlie St. NW

Birmingham, Ala. 35205
908 S. 20th St.

Charlotte, N. C. 28202
American Bldg.
201 S. Tryon St.

Columbia, S. C. 29201
1801 Assembly St.

Jackson, Miss. 39201
U. S. Post Office & Courthouse Bldg.
Capital & West Sts.

Jacksonville, Fla. 32202
Federal Office Bldg.
400 W. Bay St.
P. O. Box 35067

Miami, Fla. 33130
Federal Office Bldg.
51 SW First Ave.

Nashville, Tenn. 37219
Security Federal Savings & Loan Bldg.
500 Union St.

MIDWESTERN AREA
Chicago, Ill. 60604
Federal Office Bldg.
219 S. Dearborn St.

Chicago, Ill. 60604
Federal Office Bldg.
219 S. Dearborn St.

Des Moines, Iowa 50309
New Federal Bldg.
210 Walnut St.

Detroit, Mich. 48226
Book Bldg.
1249 Washington Blvd.

Indianapolis, Ind. 46204
Century Bldg.
36 S. Pennsylvania St.

Kansas City, Mo. 64106
911 Walnut St.

Madison, Wis. 53703
25 W. Main

Minneapolis, Minn. 55402
Reimann Bldg.
816 Second Ave. S.

St. Louis, Mo. 63102
Federal Bldg.
208 N. Broadway

SOUTHWESTERN AREA
Dallas, Tex. 75202
1309 Main St.

Albuquerque, N. M. 87101
Federal Bldg.
500 Gold Ave. SW

Dallas, Tex. 75201
Mayflower Bldg.
411 N. Akard St.

Houston, Tex. 77002
Niels Esperson Bldg.
808 Travis St.

Little Rock, Ark. 72201
Post Office & Court House Bldg.
600 W. Capitol Ave.

Lubbock, Tex. 79401
Federal Office Bldg.
1616 Nineteenth St

Marshall, Tex. 75670
Travis Terrace Bldg.
505 E. Travis St.

New Orleans, La. 70130
Gateway Bldg.
124 Camp St.

Oklahoma City, Okla. 73102
Oklahoma Martgage Bldg.
324 N. Robinson St.

San Antonio, Tex. 78205
Manion Bldg.
301 Broadway

ROCKY MOUNTAIN AREA
Denver, Colo. 80202
721 Nineteenth St.

Casper, Wyo. 82601
Western Bldg.
300 N. Center St.

Denver, Colo. 80202
Federal Office Bldg.
1961 Stout St.

Fargo, N. D. 58102
American Life Bldg.
207 N. Fifth St.

Helena, Mont. 59601
205 Power Block
P. O. Box 1690

Omaha, Neb. 68102
Federal Building
215 N. Seventeenth St.

Salt Lake City, Utah 84111
Federal Bldg.
125 State St.

Sioux Falls, S. D. 57102
National Bank of South Dakota Bldg.
8th & Main Ave.

Wichita, Kansas 67202
120 S. Market St.

PACIFIC COASTAL AREA
San Francisco, Calif. 94102
Federal Bldg.
450 Golden Gate Ave.

Anchorage, Alaska 99501
632 Sixth Ave.

Boise, Idaho 83702
Idaho Bldg.
216 N. Eighth St.

Honolulu, Hawaii 96813
1149 Bethel St.

Los Angeles, Calif. 90014
849 S. Broadway

Phoenix, Ariz. 85004
Central Towers Bldg.
2727 N. Central Ave.

Portland, Ore. 97205
921 SW Washington St.

San Diego, Calif. 92101
110 W. C St.

San Francisco, Calif. 94102
Federal Bldg.
450 Golden Gate Ave.

Seattle, Wash. 98104
Smith Tower
506 Second Ave.

Spokane, Wash. 99210
U. S. Court House
P. O. Box 2167

DSA Assigned Government-Wide Fuel Purchasing

The Defense Supply Agency has been assigned responsibility for procurement of all fuel and petroleum products used by civil agencies of the Federal Government.

Responsibility for civil agency support will be transferred from the General Services Administration to the Defense Supply Agency on a progressive basis over a 16-month period beginning July 1.

The Defense Supply Agency will handle the procurement through the Defense Fuel Supply Center, Alexandria, Va., which purchases fuel and petroleum products for all the Military Services.

Annual procurement savings amounting to about $2.5 million are expected to result from the common support of all Federal Government activities by the Defense Fuel Supply Center.

The Defense Supply Agency currently procures more than $1.6 billion annually in fuel products for the military. Civil agencies of the Federal Government currently procure about $99.9 million annually.

Electronic Teletype May Soon Join Fleet

An electronic teletype system may soon become a standard item in the Navy's air fleet.

The unit consists of three major subassemblies: an electronic keyboard, an edit-display unit and a page printer. The subassemblies can be separated to perform remotely from each other.

The edit-display unit permits the operator to type out a message, correct it and insert it into the memory of the system, to be transmitted later. The memory holds up to 10,000 words.

With proper interface, the page printer can print 50,000 words per minute, using a fiber optic cathode ray tube for non-impact printing on sensitized paper. The electronic system is also capable of standard 100-word-per-minute teletype transmission.

When connected to a converter, the equipment can also receive and print information from an analog computer containing anti-submarine warfare and oceanographic data.

Hall of Heroes Opens in Pentagon

To honor the more than 3,200 recipients of the Congressional Medal of Honor, the Defense Department has opened a shrine room in the Pentagon, called the Hall of Heroes (see cover art).

The hall was dedicated by President Lyndon B. Johnson May 14 during a ceremony attended by Secretary of Defense Clark Clifford, the Secretaries of the Army, Navy and the Air Force, the members of the Joint Chiefs of Staff, members of Congress and past medal winners.

The ceremony was highlighted by the presentation of the Medal of Honor by President Johnson to four combat veterans of the Vietnam war. The historic occasion marked the first time that the medal was presented to a member of each of the four Armed Services during the same ceremony.

Plaques bearing the name of every serviceman, who has won the nation's highest award for heroism in the past 100 years, line the wall of the Hall of Heroes. Huge reproductions of the Medal of Honor are also on display as well as the actual medals. Recorded messages giving the history of the award are provided via telephone receivers.

In the past, 2,215 medals have been presented to soldiers, 731 to navymen, 245 to Marines, 46 to airmen and 1 to a coast guardsman. Thirty-seven, medals, including the awards made during the dedication, have been presented to heroes of the Vietnam war.

The Hall of Heroes is located in the "A" ring of the Pentagon at the end of the corridor from the Mall entrance.

Four Congressional Medal of Honor winners are on hand during dedication ceremonies of the Pentagon's Hall of Heroes. The four received their medals from President Johnson earlier in the proceedings. Winners are: (left) Specialist Five Charles C. Hagemeister, USA, Lincoln, Neb.; Sergeant Richard A. Pittman, USMC, Stockton, Calif.; Boatswain's Mate First Class James E. Williams, USN, Darlington, S.C.; and Captain Gerald O. Young, USAF, Anacortes, Wash.

MEETINGS AND SYMPOSIA

JULY

International Conference on Crystal **Growth**, July 15-19, at the University of Birmingham, England. Sponsors: Air Force Cambridge Research Laboratories, U.K. Ministry of Technology, International Committee on Crystal Growth and the International Union of Pure and Applied Physics. Contact: Charles S. Sahagian (CRWB), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01730. Phone (617) 274-6100, Ext. 3298.

High Temperature Chemistry Research Conference, July 29-Aug. 2 at Crystal Inn, Wash. Sponsor: Office of Aerospace Research. Contact: Dr. George Parks, Dept. of Chemistry, University of Rhode Island, Kingston, R. I. 02881.

Aurora and Airglow Conference, July 29-Aug. 10, at the Agricultural College of Norway, As, Norway. Sponsors: Office of Aerospace Research, Office of Naval Research, DASA and the Air Force Cambridge Research Laboratories. Contact: Mr. K. W. Champion, Air Force Cambridge Research Laboratories (CRUB), L. G. Hanscom Field, Mass. 01730. Phone (617) 274-6100, Ext. 3033.

AUGUST

International Federation for **Information Processing** (IFIP) International Conference, Aug. 5-10, at Edinburgh, Scotland. Sponsor: Office of Aerospace Research. Contact: Mrs. R. W. Swanson, Air Force Office of Scientific Research (SR), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5407.

Space Maintenance and Extra-Vehicular Activities Second National Conference, Aug. 6-8, at Las Vegas, Nev. Sponsors: Air Force Aero Propulsion Laboratory, Ling-Temco-Vought and NASA. Contact: Mr. Clodfelter (APFT), Wright-Patterson AFB, Ohio 45433. Phone (513) 357-1110, Ext. 55875.

Second International **Liquid Crystal** Conference, Aug. 12-16, at Kent, Ohio. Co-sponsors: Office of Scientific Research and Kent State University. Contact: Lt Col. E. T. Walford, Office of Aerospace Research (SRC), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5337.

Physiological Basis for Human Work Performance Symposium, Aug. 24, at Boston University. Sponsors: Army Research Institute of Environmental Medicine, Boston University and the American College of Sports Medicine. Contact: Dr. Ralph F. Goldman, Dir., Military Ergonomics Laboratory, Army Research Institute of Environmental Medicine, Natick, Mass. 01760.

Physiological Sciences Twenty-Fourth International Congress, Aug. 25-30, in Washington, D.C. Sponsor: Office of Aerospace Research. Contact: Dr. Harvey Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5041.

Fifth International Congress on **Photobiology**, Aug. 26-31, at Dartmouth College, Hanover, N.H. Sponsor: Office of Aerospace Research. Contact: Dr. R. B. Stevens, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20428. Phone (202) 961-1200.

SEPTEMBER

Fifteenth Technical Meeting of the AGARD Avionics Panel on **Techniques for Data Handling in Tactical Systems**, (dates undetermined), at Amsterdam, Netherlands. Co-sponsors: AGARD and NATO. Contact: Dr. Irving J. Gabelman, Program Chairman, Advanced Studies Group, Rome Air Development Center (EMD), Griffiss AFB, N.Y. 13440. Phone (315) 330-7208.

International Conference on **Temperature and Cold**, Sept. 2-6, at Aspen, Colo. Sponsor: Office of Aerospace Research. Contact: Dr. Harvey Savely, Air Force Office of Scientific Research (SRL), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OX 4-5041.

International Conference on **Light Scattering in Solids**, Sept. 3-6, at New York University. Sponsor: Army Research Office-Durham. Contact: Dr. Charles Baghosian, Physics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706. Phone (919) 286-2285, Ext. 34.

Solid Mechanics Symposium, Sept. 10-11, at Baltimore, Md. Sponsor: Materials Advisory Group of the Army Materiel Command. Contact: Joseph L. Bluhm, Technical Working Group on Materials, Army Materials and Mechanics Research Center, Watertown, Mass. 02173. Phone (617) 926-1900.

Tenth Annual Meeting of the **Military Testing** Association, Sept. 16-20, at San Antonio, Tex. Co-Sponsors: Military Testing Association and Aerospace Medical Div., Personnel Research Laboratory. Contact Mr. Fotis, Aerospace Medical Div., Personnel Research Laboratory, Lackland AFB, Tex. 78236. Phone (512) 674-3211, Ext. 36145.

Advanced Planning Briefing for Industry on Naval **Ordnance/Missiles**, Sept. 18-19, at Coronado, Calif. Classified Secret. Co-sponsors: Naval Material Command and the American Ordnance Association. Contact: Cmdr. A. D. Sullivan, USN (Ret.), American Ordnance Association, 17th and H Streets, N.W., Washington, D.C. 20006. Phone (202) 347-7250.

Aerodynamic Deceleration Systems Conference, Sept. 23-25, at El Centro, Calif. Co-Sponsors: Defense Department Joint Parachute Test Facility and the American Institute of Aeronautics and Astronautics. Contact: Earl C. Meyers, 6511th Test Group Parachute, Naval Air Facility, El Centro, Calif. 92243. Phone (714) 352-6642.

New Nozzle Improves Wind Tunnel at Arnold Engineering Development Center

A new nozzle is being used in one of the wind tunnels at the Air Force's Arnold Engineering Development Center in Tennessee to produce more accurate simulation of hypervelocity flight for tests of atmospheric re-entry vehicle models.

Development of the new nozzle was started by ARO, Inc., contract operator of the center, when inaccuracies were found in some of the data obtained in conical nozzle wind tunnels. Studies showed that the flow was not smooth and uniform when it passed over the model in the test section at the nozzle exit.

The wall of a wind tunnel nozzle must be shaped in a definite way so that the air or other test gas will accelerate to the desired speed and still be uniform. Before the new nozzle was developed, high-performance wind tunnels operating at Mach 20 were designed with conical, or straight, nozzle walls.

In a contoured nozzle, the nozzle wall is curved gently from the wind tunnel throat to the test section. The main problem in the design of the Mach 20 contoured nozzle was that the wind tunnel flow accelerated too fast and then had to slow down before it reached the model.

As the test gas slowed down, a nonuniform flow was created that could not be used for testing. It was found that the shape of the nozzle wall was extremely critical in part of the nozzle. Two nozzles were built and tested before sufficient design information was available to build the final nozzle.

With the nozzle, tests of hypervelocity flight vehicle models are producing precise data, which are projected to actual flight to provide accurate predictions of how full sized flight vehicles will perform.

Project Brilliant Puts Light on Target

An attack aircraft streaks across the dark night sky. Suddenly a brilliant light beams down from the plane, and trucks and troops on the ground are exposed in a light 500 times brighter than moonlight.

Such a scene could soon become reality as a result of "Project Brilliant," an Air Force program to develop a high intensity, pod-mounted ground illumination system.

Designed to fit an F–4 aircraft fuel pod, the illumination system is about 3 feet in diameter and 10 feet long. The complete unit, including generator, light system and fuel, weighs less than 2,000 pounds. The generator system weighs about 1,000 pounds and uses a magnetohydrodynamic (MHD) channel power supply.

Officials at the Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio, director of Project Brilliant, claim that the light power source could be doubled without substantially increasing the weight. A 2-megawatt illumination system would weigh about 3,000 pounds.

The Project Brilliant system uses a combination of jet fuel and oxygen for the modified Atlas vernier rocket engine used as a burner. Jet fuel is drawn from the aircraft system, and oxygen stored in the pod. Highly reliable, the illumination system has no moving parts.

Chrysler Corp. will integrate components of the system and build the MHD channel. Ground testing of a full-scale breadboard model will be conducted at the Arnold Engineering Development Center in Tennessee.

The Air Force expects the exploratory phase of the contract to be completed by the end of this year.

Satellite May Improve Aircraft Communications

An orbiting vehicle, equipped with a UHF teletype system capable of transmitting 60-word-a-minute messages over ground distances up to 8,000 miles, is being used by the Air Force in tests to improve communications between aircraft.

The orbiting vehicle for the tests is an experimental satellite (LES–5) developed by Lincoln Laboratory, Lexington, Mass. The satellite is equipped with a UHF repeater unit which translates and repeats all signals it receives on the "up" frequency to a different "down" frequency.

The extreme altitude of the satellite—20,000 miles—allows a line-of-sight that stretches nearly half-way around the world.

LES–5 was originated by the Air Force and Lincoln Laboratory for experimental use between air vehicles.

Engineering implementation for the current testing is being performed by the Deputy for Engineering, Aeronautical Systems Division, and the Air Force Avionics Laboratory of the Air Force Systems Command.

Eventually the system under study may be utilized by the Air Force and other defense elements for communications between attack aircraft flying at low levels and rear area air controllers; for an Air Force world-wide logistic control and status reporting system for logistic stores; and for strike and reconnaissance reporting.

The Navy and Army are also utilizing and testing similar UHF teletype systems in ships, submarines, naval aircraft, and Army quarter and half-ton vehicles.

Reminder

The Changing World of Electronics Conference and Exposition, Sept. 9–11, Sheraton Park Hotel, Washington, D. C. Sponsor: Institute of Electrical and Electronics Enginers. Contact: Mrs. Harriet H. Manley, Page Communications Engineers, Inc., 3300 Whitehaven St. NW, Washington, D. C. 20007, Phone (202) 337–7600.

Defense Documentation Center Reports User Needs Study Results

Howard B. Lawson

The Defense Department spends approximately $7 billion a year on research, development, test and evaluation of weapon systems. One of the by-products of a program of this magnitude is an avalanche of technical reports. There is a veritable treasure of scientific and technical information in this documentation.

A major problem in the design of an information system is to channel the required information to interested persons as efficiently as possible. The goal is to provide the right information to the right person, in the right form, at the right time. A first step in achieving this goal is to define the user's need and his procedures for acquiring technical information.

Several years ago the Defense Department undertook to study the users of its information system in two phases. Phase I treated the flow of scientific and technical information (flow process) within DOD. The study results were published in a report titled, "DOD User Needs Study, Phase I (Government Personnel)," referred to herein as Reference 1.

This article presents an overview of Phase II of the study which treated the flow process within the defense industry. It condenses the findings and conclusions of the investigation's final report titled, "DOD User Needs Study Phase II (Industrial Personnel)," (Reference 2). It also covers the summary and extension of the study's analysis provided in a supplemental report titled, "Flow of Scientific and Technical Information: The Results of a Recent Major Investigation," (Reference 3).

Phase II Study Approach

The objective of Phase II was to characterize the defense industry's scientific and technical information needs, and the flow process required to satisfy these needs. The study's conclusions are as important to scientific and technical management as they are to those directly concerned with the flow process.

Useful scientific and technical information does not flow in a void. It flows from the interaction of people, their information needs, and their behavior patterns. A study of the flow process explores the dynamics of people, needs and behavior. Present methodology does not prescribe a unique approach to the study of this dynamic communication problem. An analysis of currently available survey techniques indicated that an investigation of critical incidents would assure the acquisition of specific data on the flow process. Thus, the study data are based on specific experiences in the user's work environment, and not upon his opinions, judgments, or other generalities. To be eligible for the study, an incident must have been the most recently completed task that involved scientific or technical consideration, required a total of eight hours or more of the interviewee's effort, and had tangible and clearly indentifiable output (*e.g.*, a briefing or technical report). Each task then was divided into basic information units which permitted the resulting needs and behavior to be examined in detail.

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The author gratefully acknowledges the assistance of Dr. Arnold F. Goodman, senior author of this investigation's final report and sole author of the analysis in Reference 3. He provided summary data for this article from his paper.

Data were obtained by personal interviews with a representative sampling of 1,500 from a population of approximately 120,000 scientists, engineers and technical personnel. These personnel were employed by 73 companies, 8 research institutes and 2 universities which were contractors or grantees of DOD.

To ensure high-quality data, the interviewers were thoroughly trained, and the interviews were carefully recorded and checked for accuracy and consistency. The interviewers asked 63 questions in the following 4 subject areas:

- The *user* of scientific and technical information.
- The user's most recent scientific or technical *task*.
- The user's general *utilization* of the information system.
- The user's *search and acquisition* process for information used in task performance.

Many studies have been performed, and much has been written, concerning the information flow process. The tendency, however, has been to examine only small portions of the process, or to speculate about large portions of the process in generalities. Therefore, very little of a comprehensive, definitive and unifying nature has been said about the actual flow. The DOD User Needs Studies were the initial attempts to obtain data on so large a portion of the process. The Phase II analysis was the first attempt to draw definitive and unifying conclusions from such data.

The analytical approach of Phase II is summarized, as well as described in detail, both in Volume 2 of Reference 2 and in Reference 3. It will suffice here to observe that, in addition to the compilation of frequency distributions for the answers to a question or a pair of questions, a relationship analysis cycle has been followed. In this cycle, qualitative question responses were transformed into numerical form. Then a model for potential relationships among questions was constructed and estimated. Finally, the numerical relationship results were transformed back to qualitative form to yield significant input and output factors for the flow process.

Characterization of the Flow Process

The findings of the investigation, which characterize the flow process, are highlighted in this section. They are supported by the numerical results in Volume 3, Reference 2.

Type of Information Desired.

- Almost one-half of the information was in the engineering fields.
- Almost two-fifths of it was in scientific fields.
- In the conceptual-design and performance-production cycle, over 60 percent of the information involved design and performance.

Desired Media for Receiving Information.

- Oral information was wanted more than one out of three times.
- Semi-formally written information was wanted more than one out of three times.
- Over 60 percent of the information was desired in more than one document.
- Almost three-fifths of the time, a specific answer was needed.
- Over one-third of the time, a detailed analysis was needed.

First Source Contacted for Information.

- In 80 percent of the cases, either no search was required or the users first searched for information within the local work environment. (The "local work environment" extends only as far from the user as an internal company consultant. It does not extend as far from him as his organization's technical information center [library], which is his connection with the formal information system.)

Acquisition Time for Information.

- Almost one-half of the information was needed within 7 days.
- Almost three-fourths of it was needed within 30 days.
- Except for 5 percent of the information, the information needs were satisfied within the allowable acquisition time.

Utilization of Information.

- Over two-fifths of the information was used throughout the entire task.
- Over one-third of it was used in major portions of the task.
- Almost 80 percent of the information was absolutely essential to the task.
- Over 15 percent of it was extremely helpful in the task.

Utilization of the Formal Information System.

- Of the users, 95 percent utilized their organization's technical information center (library).
- Over 50 percent utilized it twice a month or more.
- Title listings or abstracts of information media would have been useful for finding more than two-fifths of the needed information.
- The Defense Documentation Center (DDC) was utilized by almost one-half of the users. On the other hand, DDC was unknown to almost one out of three of the users.[1]
- The DDC Technical Abstract Bul-

[1] *A recent review of the data by the author reveals that although 470 subjects indicated they did not know of DDC, 277 of these work for organizations which are among the top 100 users of DDC which annually request over 240,000 documents. It would appear that some of the subjects were unaware of the use that a corporate intermediary, such as the technical information center or library, actually makes of DDC. (See article, "Programs and Services of the Defense Documentation Center," Defense Industry Bulletin, April 1968, page 1.)*

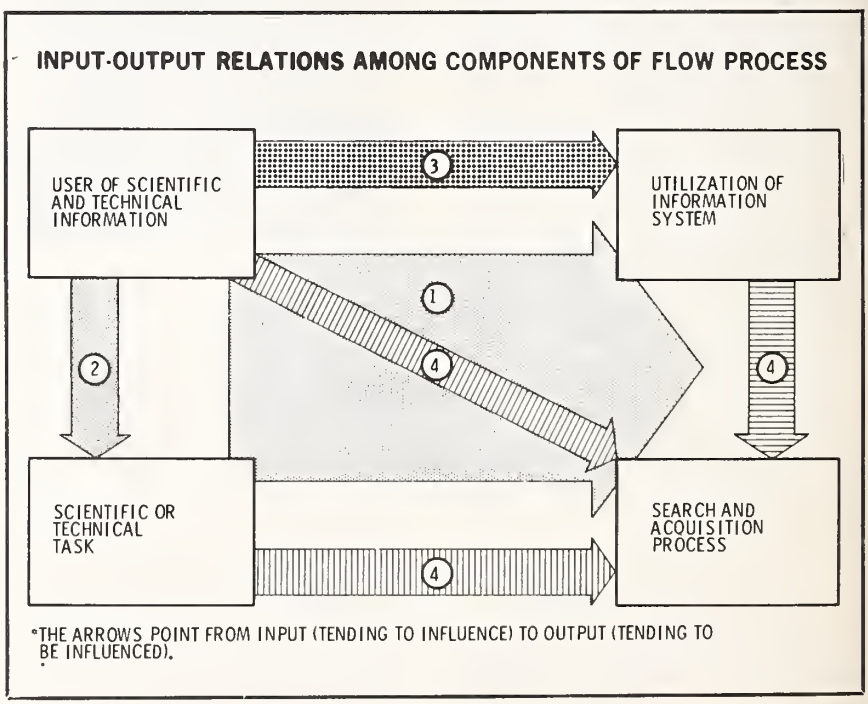

Figure 1.

letin (TAB) was utilized by less than two out of five users.

- TAB was unknown to over two out of five users.
- Less than 20 percent of the users utilized the National Aeronautics and Space Administration's Scientific and Technical Aerospace Reports (STAR).
- Over 60 percent of the users did not know of STAR.
- Over two out of five users encountered difficulties in the utilization of the information system within this frame of reference. Lack of timely awareness of information accounted for almost two-fifths of these difficulties. Lack of timely acquisition of information accounted for one-half of them.

Major Output of Assigned Scientific or Technical Tasks.

- More than 50 percent of the tasks were in engineering fields.
- More than 30 percent of them were in scientific fields.
- In the research-development-production cycle, almost two-thirds of the tasks were development.
- Two out of three tasks involved design and performance, within the conceptual-design and performance-production cycle.

Users of Scientific and Technical Information.

- Over one-half of the users held engineering positions.
- Almost one-third of them held scientific positions.
- In the research-development-production cycle, two out of three users occupied development positions.
- Of the users, 40 percent were not managers.
- Over 30 percent managed from one to five persons.
- More than one-half of the users possessed a bachelor's degree.
- Almost one-third of them possessed an advanced degree.

Flow Process from an Input/Output Point of View.

For design and analysis of the flow process, it is meaningful to consider the flow process from an input/output point of view (Figure 1). Input represents "tendency to influence," output represents "tendency to be influenced," and an arrow represents "the tendency of influence from input to output."

The components of the flow process are *user, task, utilization,* and *search and acquisition.* For the flow process in general, *user* and *task* act as input components; and *utilization* and *search and acquisition* act as output components (Arrow 1 in Figure 1). The other input/output relations among components of the flow process have the following:

- *User* as input component, and *task* as output component (Arrow 2 in Figure 1).
- *User* as input component, and *utilization* as output component (Arrow 3 in Figure 1).
- *User, task,* and *utilization* as input components, and *search and acquisition* as output component (Arrows marked 4 in Fgure 1).

Within each component, there are input factors and output factors. Factor represents "combination of related questions." Figure 2 presents the input and output factors for the flow process in general, which corresponds to Arrow 1 in Figure 1. For similar information on the input and output factors for *user, task, utilization,* and *search and acquisition,* see Reference 3.

One must realize, however, the statistical techniques of the analysis can merely characterize a relation. They cannot imply that a relation is cause-and-effect, for this can only be determined by a thorough understanding of the flow process.

Goals for the Flow Process

The conclusions of the investigation provide a set of goals for the flow process,[2] and a measure with which to evaluate a general information system. These goals are supported by the preceding characterization of the flow process, and the quantitative results which appear in Volume 3 of Reference 2.

The Flow Process.

Figure 3 is helpful in visualizing the goals described by the remainder of this section. It represents either of the following processes:

- The flow process in task performance, when *utilization* represents the utilization of the information system in task performance.
- The flow process in general, when *task* represents the user's scientific or technical task in general.

Bridge the Information Gap.

An information gap exists between the user of scientific and technical information, and the information system which serves his needs. This information gap must be bridged if the user is to obtain high-quality information.

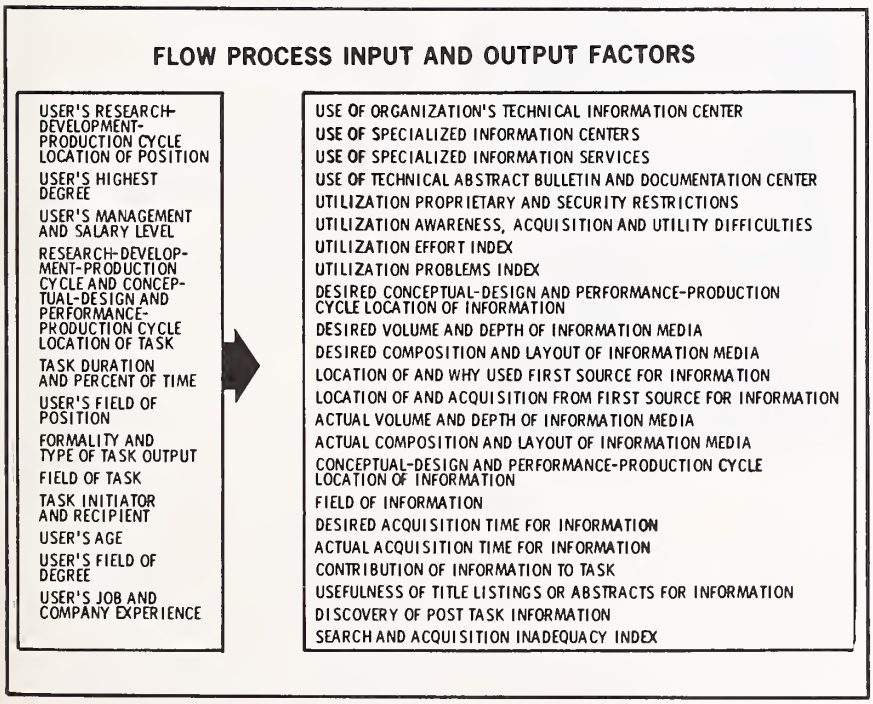

Figure 2.

[2] *The goals for the flow process are a result of analysis performed subsequent to publication of Reference 2 and are contained only in Reference 3.*

Reorient the User and the Information System.

Both the user and the information system need to be reoriented. Scientists and engineers, especially those in management or those possessing advanced degrees, must become active seekers of high-quality information services. For its part, the information system must become an active provider of high-quality information services, not merely a passive document repository.

Expand the Information Base.

An information base forms the foundation of the information system. In general, it contains information which is conceptual and research-oriented. The information base has to be expanded to include design and performance information, and information which is development-and-production-oriented.

Restructure the Information Base.

The information base is composed of information media which convey the information. For the most part, these media are written in form, formal in composition, and textual in layout. It must be restructured to include media which are oral in form, informal and semi-formal in composition, and graphical in layout.

Make the Information Base Flexible.

The information base should be made flexible to permit:

- Information to be indexed, abstracted, selectively organized, and selectively analyzed.
- Information to be selectively repackaged in information media of appropriate form, composition and layout.
- Information media to be indexed and abstracted.

Make the Information Base Mobile.

The information base needs to be made mobile so that information awareness is automatic, rapid and selective; and information acquisition is quick and easy.

Expand the Information System.

Expert personnel must be employed to expand the information system by providing both information resources and connections with the informal information system ("invisible college"). This expansion will add an entirely new dimension to the information system.

Extend the Information System.

The information system has to be extended into the local work environment by the automatic and selective dissemination of abstracts for media in the information base, and listings of disciplinary areas with an expert's level of competence in each area.

The Phase II study was a pioneering attempt to draw comprehensive, definitive and unifying conclusions from data on a large portion of the flow process. From the perspective gained in this study, it is clear that certain portions of the flow process merit further investigation and that there is room for refinement and extension of the analysis. A detailed discussion of the recommendations for future analysis is contained in References 2 and 3.

The Defense Documentation Center has already taken one step toward an improved DOD information system. A development plan has been proposed which will provide automatic and selective disseminations of a bibliography containing descriptions of documents within the user organization's interest profile. Also included will be the documents in microfiche format. Other special bibliographic indexes will be available.

It is hoped that the identification of some of the requirements for technical information highlighted in these user needs studies will provide the research and development community with the stimulus and motivation to improve this vital communication problem.

Reports cited in this article are available to authorized users from the Defense Documentation Center, Cameron Station, Alexandria, Va. 22314. Others may purchase them from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. (Prices: $3 hard copy; $0.65 microfiche).

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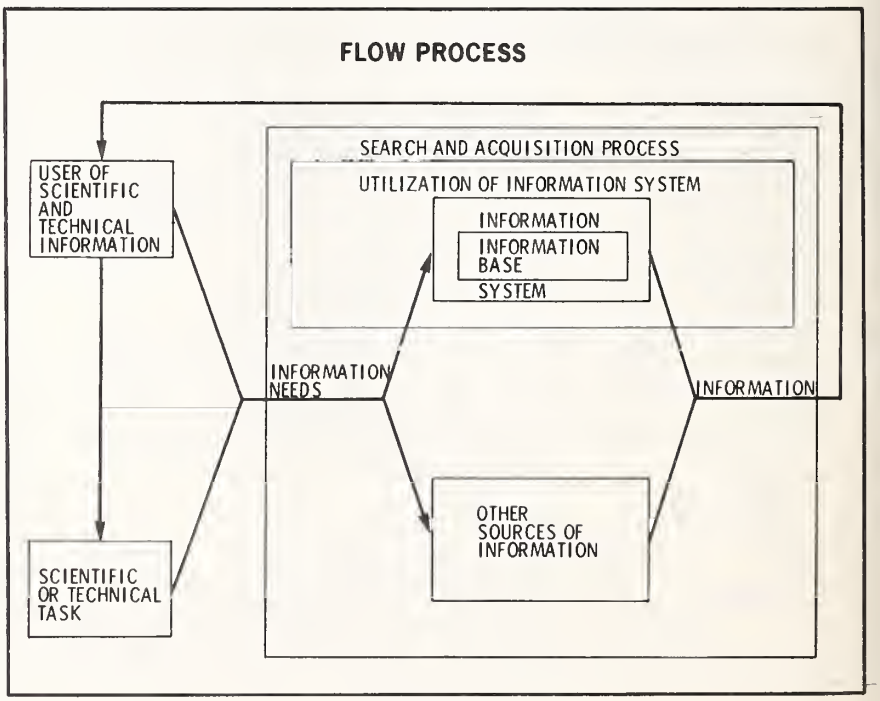


Figure 3.

Testing Techniques for System Acquisition

Captain Thomas Schwartz, USAF

The purpose of this article is to provide a brief profile of the testing techniques for system acquisition in the Air Force. The philosophy and methodology in approaching and conducting a test effort and some of the typical and significant features which have been encountered will be discussed.

The term "test" can be defined as a systematic means of collecting quantitative or qualitative information which can be analyzed and used to formulate statements within certain limits of error. This is a broad definition and, as we proceed, more specific definitions which relate directly to the kinds of tests will be made. It is fundamentally important for those engaged in testing to recognize the significance of error. Few statements are absolutely true, and limits must be presented which indicate the region where statements may be applied.

A useful rule that may be applied to tests is that they should be controlled only to the extent necessary to produce valid data for subsequent evaluation. It is necessary to avoid either compromising realism to obtain this valid data or damaging the validity of the data to achieve realism.

Policy

Tests must be designed and conducted so that test results can be analyzed. The analysis of results is the most important aspect of testing. However, evaluations can be made without current testing because of data available from other sources. Air Force Regulation 80–14, the bible for testing, lists this as the first item of Air Force policy. Other policy items are to insure that new systems are:

- Technically sound, reliable and safe for service use.
- Functionally operative, reliable, maintainable, and compatible with other systems.
- Capable of being operated and maintained by Air Force personnel and others.

System and Subsystem Test and Evaluation

System and subsystem test and evaluation are integral parts of the acquisition process. Resulting data are collected and analyzed to verify the performance characteristics, compliance with specifications, and the quantity and quality of equipment, personnel training, and logistics. The results of these tests constitute proof that the system will meet Air Force needs. Therefore, the test function really begins at the start of the acquisition process when specifications are being prepared. The importance of good specifications as a basic need for a meaningful test program cannot be overemphasized. Good specifications are documents which are not ambiguous, which are clear and not subject to interpretations, and which are well thought out and complete. The test function is a demonstration that the system complies with the specified requirements. Therefore, the test personnel participate in the preparation or review of the specifications to insure that the specified requirements are realistic and can be tested.

Captain Thomas Schwartz, USAF, is Field Test Director for the Back-Up Interceptor Control (BUIC) System and Project Officer for the Combat Lighting Program at Air Force Systems Command's Electronic Systems Division. He is a 1956 graduate of the Naval Academy and has an MS degree from the Air Force Institute of Technology.

To cite an example, the Electronic Systems Division of the Air Force Systems Command is procuring the Back-Up Interceptor Control System (BUIC) to SAGE (Semi-Automatic Ground Environment System), the prime air defense system against air breathing vehicles. This system is composed, in part, of direction centers, each of which is responsible for the conduct of air defense within its assigned area of responsibility. With the advent of technological advances, SAGE survivability became extremely vulnerable. As a result, the Air Defense Command established a manual Back-Up Interceptor Control capability. This has been updated to a semi-automatic system (BUIC II) and further improved to BUIC III. The BUIC III System consists of North American Air Defense Command (NORAD) computerized control centers and the voice, teletype, and digital data communications network to connect the NORAD control centers to each other and air defense elements. Some of the performance parameters that will be measured are height, identification, tracking accuracy, tracking stability, merit stability,

time delays, weapons target separation, kill summaries, etc. These parameters are further broken down to speed, heading and position of targets, and interceptions. Total and partial system capacity with respect to these measures are evaluated.

Test Program

Formal testing is a most complex effort requiring capable management. To carry out its testing program effectively, the Air Force has divided the testing activities into three functional categories. Two of these categories are conducted during the acquisition phase and one during the operational phase. These are designated Category I, Category II and Category III testing.

To facilitate the conduct of this test program, extensive documentation is required to be submitted by the contractor for government approval. The most important document for this testing is the system test plan, providing an overall outline of the total test program.

Category I Testing

Category I testing involves extensive tests on each unit comprising the system, or each contract end item (CEI). This is accomplished in accordance with the CEI Part I specifications and is governed by the Category I test plan which is prepared by the contractor and approved by the Government. This document provides an overall outline of the complete Category I test program, including detailed test objectives, and identifies test areas and contractor responsibility. These subsystem tests are conducted in the contractor's facility by the contractor under government supervision. The recorded test results must be approved by the Government. Usually, fabrication of production units progresses parallel with the Category I test effort. Typical examples of Category I test objectives are to determine:

- Performance, reliability and integrity of individual components.
- Preliminary operational characteristics of qualitative adequacy of the component.
- Preliminary maintainability and transportability characteristics.

Following satisfactory completion of the Category I tests, a first article configuration inspection, or FACI, is conducted by the Government on the first production machine. This establishes a baseline for configuration management. Further testing of production line machines is limited to normal quality control testing.

Category II Testing

Category II testing and evaluation covers the integration of subsystems into a complete system in as near an operational configuration as possible. Like the Category I test effort, this is accomplished in accordance with the Category II test plan which is also prepared by the contractor and approved by the Government. The Category II tests are conducted to demonstrate that the system satisfies all the requirements as defined in the system specification. These include reliability, maintainability, human engineering, safety features, etc. The level of testing conducted should permit ready identification of each parameter specified. In the case of BUIC III, some examples are number of tracks, number of radar inputs, and number of simultaneous intercepts.

The BUIC III Category II testing will be a joint contractor/Air Force effort under Air Force control at L. G. Hanscom Field during 1968. Overall management of this test effort will be by the 416M/P/418L System Program Office (SPO) through a test director. He will be assisted by a deputy for operational support appointed by the Air Defense Command and a test staff consisting of representatives from Air Force Logistics Command, MITRE Corp., System Development Corp., Burroughs Corp., and the Air Training Command. Other participating agencies are Rome Air Development Center, Ground Electronics Engineering Installation Agency, Strategic Air Command, and Federal Aviation Agency. As evidenced by the time associated with this testing and the number of agencies participating, this is a rather complex endeavor. Included in these tests will be hundreds of aircraft sorties consisting of many missions over a period of months.

Site Implementation Testing

In addition to the Category II and III testing, the BUIC System will undergo site implementation testing. The purpose of implementation testing is to insure satisfactory installation at each site of the computer programs and communications to obtain performance measures and, based on these measures, to demonstrate to the using command that the equipment and program system segment at each site is ready for operational use. This testing will be conducted at each of the BUIC III sites to be activated into the air defense environment. Like the Category II test effort, this is a complex operation requiring the participation of many agencies and contractors. Live interceptions, as well as simulated aircraft, will be used to demonstrate the system. A site activation contractor will merge the activities required for program installation and system testing into a coordinated activity under the supervision of the SPO. At the completion of the analysis and overall test effort at each BUIC III site, the sites will be turned over to the using command incrementally.

Category III Testing

Category III testing and evaluation are performed on operational systems and controlled by the operating command. Before this testing commences, agreement on system configuration must be jointly reached by the operating command, Air Force Systems Command and Air Force Logistics Command. Category III tests are designed to fulfill objectives of all participants, including Air Training Command. Typical examples of test objectives are:

- Determine and improve operational capabilities of the system in terms of tactics, techniques, doctrine and standards.
- Determine deficiencies or limitations. Provide quantitative and qualitative data for product improvement.
- Evaluate logistic system capability.
- Determine adequacy of training, technical data and safety.

Participation of Other Agencies

Participation of other agencies and organizations—excluding contractors—is arranged at the time the System Package Program (SPP) is being prepared. This document includes a test section which designates the participating agencies, and defines their responsibilities during the test program. Coordinated approval of this document comprises a commitment on the part of these agencies, and

provides them with lead time to prepare for their role in the test program.

With respect to the conduct of the testing for Categories I, II, III and the site implementation, the various aspects of a test effort will now be discussed.

Test Design

The design of any test or experiment is based on two aspects:

- A plan for collecting observed data.
- An associated plan for the analysis in interpretation of the data and the drawing of conclusions from them.

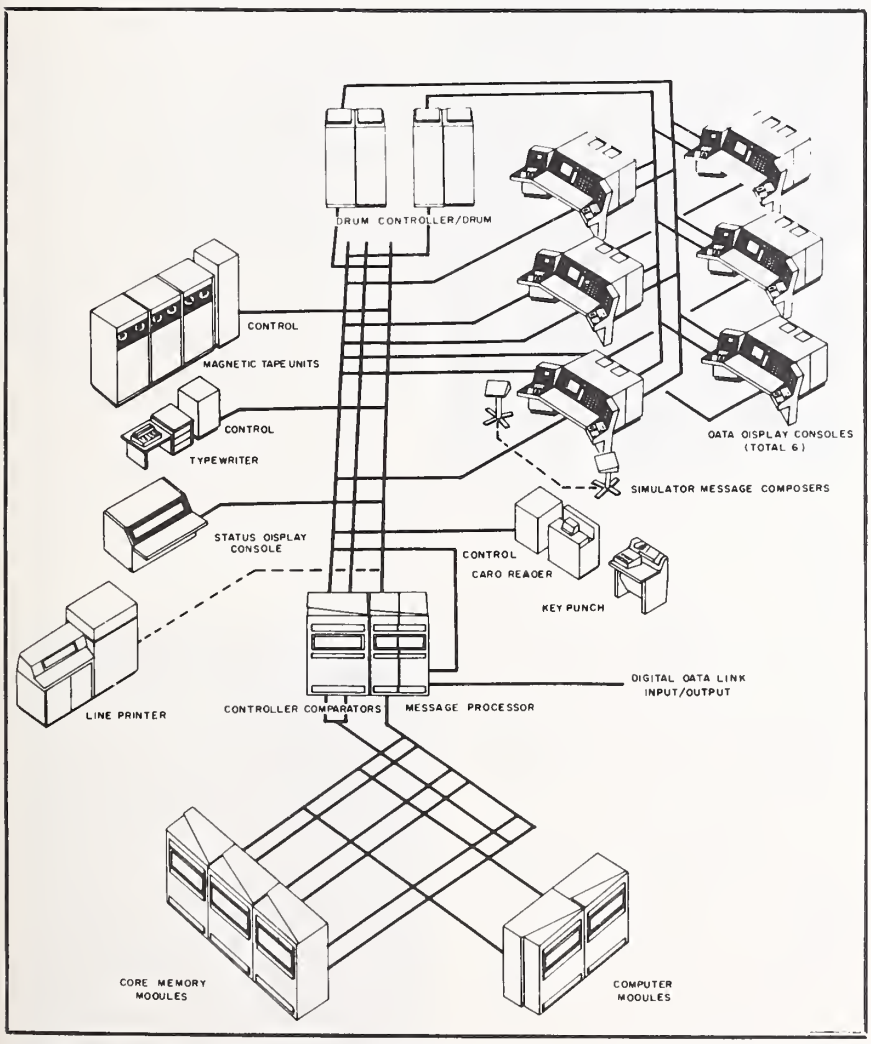
The primary purposes for test design are to assure that the conclusions will be unbiased, and to attain the required level of assurance of the validity of the results with a minimum expenditure of testing effort. Therefore, it is essential that ground rules for acceptance or rejection data be established prior to the test effort. If they are not, the project coordinator may be unduly influenced by his notion as to what the outcome of the test should be.

Collection and Processing

No matter how simple the test objectives may be, it cannot be assumed that useful data will be collected as a routine result of good test design. Test design creates the need for a detailed data control plan by designating what variables are to be measured during each phase of the test, and to what accuracy these measurements must be made. The data collection plan, in turn, indicates how these measurements must be made to insure valid implementation of the test design. This plan should formulate the mechanisms, operational procedures, and controls for the collection of useful data.

The data-gathering process may vary from semi-automation, which is prevalent in the case of the BUIC Category II testing, to minimal automation which is primarily the case with the BUIC Category I testing. However, it is almost certain that the human can never be completely eliminated from the data collection procedures.

Furthermore, total elimination of the human would not necessarily be desirable since people have capabilities and flexibility which machines will probably never equal. These data, which have been collected from a wide variety and large number of tests, are channeled into data reduction where they are processed and put into formats suitable for test analysis.



Block diagram of a Back-Up Interceptor Control Center (BUIC) which will support the SAGE air defense system in case one of its centers is destroyed. Information on aircraft is displayed on the consoles, then fed into an electronic computer which, in turn, furnishes air defense commanders with track and intercept data as well as the status of retaliatory forces.

Analysis of Test Results

After a test has been conducted and the data reduced, the problem which remains is to draw conclusions and make recommendations for action. This logical process is called inference, which is the making of the translation from the test data to a conclusion concerning the "real world" situation.

In a very real sense the drawing of this conclusion will be reduced to an almost automatic action, if the test is properly designed. In the ideal situation, if all contingencies are foreseen, the rules by which inferences are to be made are firmly fixed by the test design. The steps taken in drawing a conclusion, if the test is to be objective, are:

- Determine what kind of data should be gathered and establish what answer to the question will be given for any possible outcome of the tests.
- Gather the data in the planned way.
- Give the answer to the question based on the data gathered in the test strictly according to the procedure outlined before the data was gathered. In other words, the caprices

(Continued on Page 31)

Army Solves Water Barrier Problem

Infantry To Get "Walk in Water" Device

In an area such as the Mekong Delta of Vietnam, comprising more than 26,000 square miles of interconnecting canals, rivers, swamps, marshes and rice fields, water is a major problem for the infantryman.

To help circumvent the water barriers that hamper troop movements in certain areas of Vietnam, scientists and engineers at the Army Limited War Laboratory (LWL), Aberdeen Proving Ground, Md., have developed three new items.

The newly developed aids are: a bridge that seemingly enables soldiers to walk on water, a boat that can be breath-inflated in a few minutes, and bladders that enable a man to float across the water.

Ferreting out ways to ease the soldier's job is a prime task of the laboratory, created in 1962 as a centralized research and development activity with a quick-reaction capability for meeting requirements related to limited war.

Walking on Water

In the case of the bridge with the walk-on-water capability, an engineer in the LWL's Mobility Branch recalled the use of an experimental bridge during World War II that worked on the principle of rolling dynamic buoyancy.

Exploiting the dynamic buoyancy principle, LWL has developed a troop foot bridge that can sustain continuous column, single-file troop traffic—running, walking, or standing still. The bridge is man-portable weighing only two and one-half pounds a linear foot.

Essentially, the span is a flat self-buoyant flexible blanket that floats on the water surface until a load is placed on it. As the soldier moves over the bridge surface, the area directly stepped on presses into the water, deforming into the semblance of a shallow boat and creating water displacement buoyancy. As the soldier moves along, the depressed surface returns to its flat floating shape, shedding any water that may have accumulated on the surface of the bridge.

The combination of the water mass inertial resistance, as the bridge is pressed into the water, and the displacement buoyancy, resulting from the depression made by the moving

load, provides the supporting dynamic force which makes the bridge feasible.

Made of ½-inch thick closed cell, polyethylene flexible foam core, bonded between 2 sheets of nylon reinforced polyethylene film, the 30-pound bridge unit is 11 feet long and 7 feet wide. Up to 10 of the bridge units can be linked to provide bridge lengths up to 110 feet.

The foam-filled blanket is provided with lateral rigidity by use of ⅞-inch diameter plastic poles that are 48 inches long and spaced 30 inches apart.

Each end of the bridge is anchored to the banks of the canal or waterway by 7 aluminum rods, ⅜ inch in diameter and 24 inches long.

Easily deployable, the bridge can be placed across streams or canals through the use of an anchor with a rope attached. The anchor is tossed across the stream and the rope is then pulled through an eyelet in the anchor, thus pulling the bridge across the water. In instances where the stream may be too wide to effectively throw and emplace the anchor, a soldier must swim across with the rope.

Although the troop canal bridge provides an excellent capability for water crossings, it is not always practical for use by small patrols.

A Compact Breath-Inflatable Boat

With the development of the lightweight four-man boat by LWL's Environment and Survival Branch, a capability for water crossings is provided for small reconnaissance and clandestine operations.

Weighing 6 pounds, the boat can safely support 4 fully equipped soldiers or a load of 1,300 pounds. Utilizing a principle called air entrainment, the boat can be breath-inflated by two men in about five minutes.

The low silhouette craft is ideal for scouting operations or as a safety boat in river and canal crossing maneuvers. It is packaged so that it can be carried easily by one man, measuring 15x6x10 inches when deflated. Overall size of the inflated craft is 7 feet, 8 inches long and 3 feet, 6 inches wide.

The boat is fabricated of nylon material and has 10 inflatable bladders made of plastic film. The 10 bladders are placed in individual compartments around the perimeter of the boat. Since the boat is wholly a tension structure, with only the air in the bladders under compression, it is capable of carrying a full load even if three of the bladders become punctured. A false bottom in the boat provides a stabilizing ballast of water.

Two aluminum paddles are provided with the boat that may be joined to form a kayak-type paddle, which is desirable in the event only one man is paddling the boat. The standard infantryman's entrenching tool is also suitable for use as a paddle.

Floating on Water

The answer to water crossings on an even smaller scale is provided by LWL's development of flotation gear for the individual soldier.

During the monsoon season in Vietnam, soldiers encounter many flooded streams and rivers which cannot be crossed by wading. Carrying a full load of equipment, weapons and ammunition, even the best of swimmers find it almost impossible to cross these swollen waters. To solve this problem, an individual lightweight float device has been developed.

The reusable flotation device weighs only eight ounces and comes in a pouch that is carried on field-pack suspenders. The gear is enclosed in a one-piece lightweight cover which, after inflation, forms a U shape around the body. It is worn with the open end toward the man's back.

Capable of supporting the fully equipped soldier during water crossings, the gear contains three separate compartments and bladders which are breath inflated. Using only 2 bladders, it will support a man plus 60 pounds of equipment.

The side bladders are designed to provide adequate buoyancy, with additional buoyancy provided by the front bladder. Since all bladders are interchangeable, the front bladder can also be used as a spare.

The flotation gear is also equipped with grommets on the corners, enabling several units to be tied together to form a raft. The size of the raft would be limited only by the number of flotation units available.

With the successful completion of the three new limited war items, troops in Southeast Asia will find it much easier to maneuver in swampy environments, especially during the rainy seasons of the year.

Digital Device Speeds Combat Communications

Navy and Marine Corps combatants will soon be able to call for air support by pressing keys on a hand-held digital message device.

Known as data transmission and switching, the system is designed to speed up the flow of messages in combat areas. It will transmit bursts of digital data over existing communications equipment to computer-selected command centers.

Transmission is simple. Pushing the "send" button releases stored information in a single burst to a receiving complex. The data is then channeled to the proper command elements. The receiving end prints a copy of the message. A message requesting air support would go directly to an air post which would vector close air support aircraft to the target.

The system requires no voice transmission and provides 60 separate classes of messages, including air support and fire support requests, logistics messages and intelligence reports.

Kelly AFB Assumes Support Management for C–10A Transport

System support management of the Air Force's new C–10A transport aircraft has been assigned by the Air Force Logistics Command (AFLC) to the San Antonio Air Materiel Area (AMA), Kelly AFB, Tex.

Logistic support for the C–10A will be provided by the manufacturer, Handley Page, Ltd., of Great Britain. San Antonio AMA will monitor the logistic support contract as well as acting as the AFLC engineering agency.

The San Antonio organization will take part in acquisition engineering activities, perform operational engineering, and plan for assumption of the Air Force engineering responsibility.

The C–10A is a light transport which carries up to 18 passengers. It has twin turbo-prop engines, cruises at 300 miles an hour at altitudes up to 30,000 feet and has a range of 1,000 miles.

USAF Awards Study Contract for AGM–X–3 Tactical Missile

The Air Force has awarded three study contracts for a long-range, stand-off tactical missile known as the AGM–X–3. The six-month contracts have been awarded to Hughes Aircraft Co., Martin-Marietta Corp., and The Boeing Co. Total funding for the contracts is $650,000.

Purpose of the studies is to define the concept and establish the technical development plan for the AGM–X–3. Contractors will examine the existing research in areas of avionics and propulsion.

The AGM–X–3 is expected to operate in adverse weather and be compatible with the current and projected attack aircraft. Operational time period would be in the early or mid-1970s.

The study contracts are under the direction of the Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson AFB, Ohio.

Industrial Preparedness Against Civil Disorder

Major General Carl C. Turner, USA

[Editor's Note: Major General Carl C. Turner, USA, the Provost Marshal General, Department of the Army, has technical staff supervision over the Industrial Defense Survey Program of the Defense Department Industrial Defense Program. He is the personal representative of the Chief of Staff, U.S. Army, at the scene of major riots and civil disorders in the United States. These functions provide him firsthand knowledge of the needs of industry in preparing against the effects of civil disorders. His organization develops criteria and standards to be applied to the industrial defense survey of each facility participating in the Defense Department Industrial Defense Program.

The Survey Program has increased the awareness of industrial management on the need for sound plant security systems and emergency preparedness planning. The purpose of the Defense Department Industrial Defense Program is to assist management of selected industries and utilities in the development of plans and procedures to safeguard against sabotage and other hostile or destructive acts. While this program does not specifically include civil disorders, an ancillary effect can be derived by proper application of plant security and emergency preparedness measures. The objective is to provide a viable production base responsive to defense production programs and military operations during an emergency.

In this article he offers his thoughts, and those of the personnel of his Industrial Defense Branch, on a practical approach to the complex problem of developing a plan designed to minimize the effects of civil disorders, sabotage, and simultaneously reduce loss resulting from theft and pilferage.]

Riots and civil disorders, or even the possibility thereof, disturb the peaceful slumber of virtually every business and municipal executive and law abiding citizen in the country today.

Acts of violence and destructive civil disorder are in clear violation of the law, but are often improperly camouflaged as "demonstrations." We must be mindful of the difference. A demonstration is the peaceful expression of a constitutional right to petition government for redress of grievences. Concern with riots and civil disorder should not lead us to confuse illegal activities with lawful demonstrations.

Responsibility for protection of property is inherent in ownership. Therefore, industry has a responsibility in the total community effort and a singular responsibility in protecting its vested private interests. The capability of industry to lessen the impact of civil disorders on its operations depends primarily on two basic factors—proper planning and competence in performance.

Many executives of industry have not felt the full impact of the riotous conditions of last summer. For this reason they may have been lulled into a false sense of security. They may have fallen into the trap of thinking "why plan for such a thing? Surely it won't happen in our city to our property." However, incidents such as those of last summer, and those which occurred during April this year, are not restricted to the large metropolitan areas. A small incident in an urban or even a rural area can erupt into a disorder of considerable magnitude.

The difficulty of containing these disturbances places our industrial base in a precarious position. The momentum and shifting of such incidents may well bring your plant into direct focus of the riotous group. If you have not planned for this contingency, your operations could well be disrupted and your property severely damaged.

All effective countermeasures to emergencies imply some degree of prior planning. Their effectiveness is usually proportionate to the thoroughness and soundness of the planning effort. Realistic planning concepts, if followed, will produce sound plans; but if ignored, will produce unrealistic, unworkable plans.

Pre-emergency planning is one of management's major responsibilities today. It cannot be pushed lightly to one side in the false hope or assumption that "nothing will ever happen to us."

The "hardening of the shell" of our industrial complex, by logical, realistic pre-emergency planning is a matter of dollars and "sense." The expenditures in actual dollars can easily be limited while establishing a workable program which will more than pay for itself in the long run. It is an insurance policy which can fully justify its cost in an emergency.

Although this article addresses planning for civil disorder emergencies, an effective plan would yield ancillary benefits. With minimum modification, an effective civil disorder plan could also be used during natural disaster emergencies, or large scale industrial accident emergencies, or against sabotage. Likewise, an existing plan designed to cope with these other emergencies could be modified to handle civil disorder emergencies.

Planning must start now. It is too late to start planning or to initiate effective steps to protect people, plant and equipment after the emergency occurs. It is better to be prepared than unprepared, even if nothing happens. Good planning and sound de-

fense preparedness will do much to minimize post-emergency confusion, uncertainty and fear, both in damaged and undamaged areas, and will contribute greatly to recovery from the emergency.

The effort devoted to developing a good plan can be equally as productive as safety and fire insurance. It is indeed a form of insurance. To assure the continuity of your corporate earnings, a properly developed plan may well be one of your wisest investments. The plan will yield dividends commensurate with the expenditure, realism and thoroughness which contributes to its development. The returns may be immediate or long-range, or both, but when an emergency arises necessitating implementation of the plan, the returns will be readily recognized.

In the final analysis, you must answer the question "How much am I willing to spend to protect my people, my plant, and the investment of the stockholders?" The answer will chart your course in emergency planning, and will contribute in large measure to the degree of protection you will have during a civil disorder, or other hostile or destructive acts.

Emergency planning is not an exact science. It is not a field where precise definitions can be given, or where precise solutions are offered. Planning depends upon the requirements the planner must meet and upon the many variables involved. This article introduces one approach, not necessarily the only approach to developing a sound, effective emergency plan to minimize damage which could result from civil disorders and other hostile or destructive acts. (An industrial emergency plan outline check list, pointing out essential areas to be considered, is provided at the end of this article.)

Concepts for Planning

Industrial emergency planning against the effects of civil disorders and other hostile or destructive acts should embrace the following concepts:

Realism.

The planning goal must be realistic. Any practical plan will fall short of a perfect plan. However, realism is assured if planning is oriented for the most serious eventualities, and the plan is developed to be implemented under emergency conditions which may seriously curtail the normal conveniences, and present special problems of personnel and morale. Planning must be phased with definite planning goals and reasonable achievement dates.

Self-help.

Each facility is responsible for assuring the continuity of its operations by planning and putting into effect measures necessary to minimize damage from civil disorders or other destructive acts. Self-help implies proper utilization of existing personnel and resources to fight trouble from within. A sound emergency plan provides for maximum utilization of existing organizational structure, proven supervisory and technical skills, and material and equipment on hand. The emergency organization should not be a substitute for, but an extension of, the organization which has proven effective in routine operations. Personnel who give directions during an emergency should, insofar as is practicable, be supervisors from whom employees are accustomed to receiving directions. The skill to perform specialized emergency tasks should be derived from occupational and avocational interest.

Coordination (Mutual Aid).

The plan should be coordinated with local officials and adjacent industrial organizations. The principle of self-help is extended to the community by a coordinated planning effort to achieve mutual goals and provide for reasonable mutual aid between the facility and the community.

Dual Approach.

The dual approach concept visualizes an operational or utilitarian use, during normal periods, of emergency supplies and facilities. For example, the first aid and medical supplies, which are stored for emergency purposes, can be rotated into normal stock use.

Identification of Critical Areas.

The protection of plant and equipment in emergencies is basically a matter of compromise. As the degree of protection rises, so does the cost. The problem of what and how to protect becomes a question of weighing the importance of the plant and equipment against the returns that can be expected from the protection provided.

Maximum effort should be expended in protecting areas that are critical to the plant operations. Short supply and long lead-time equipment should be given next priority for protection. Delicate instruments, for example, would require greater protection than large cranes. Items of machinery or equipment that have the capability of self-destruction, or of causing serious damage to other machinery or equipment, would require a high priority.

The basic unit of planning to minimize damage, and provide for rapid resumption of operations is the functional area. A functional area is composed of a group of machines or equipment performing related functions or operations. The functional areas warranting primary protection may be identified by analyzing two factors.

- The relative importance to overall production or operation.
- The relative vulnerability of machines and equipment to damage.

At the top of the scale would be a plant area which is highly important to overall production and susceptible to damage. The functional areas nearest the top of the scale should receive top priority.

A functional area criticality study might suggest the following categories:

- Group A—Those whose loss would cause an immediate stoppage of production or operation because production equipment or parts would be lost. The relative importance of the functional areas in this group is dependent upon other controlling factors: length of time to rehabilitate or procure machines, equipment, and raw materials (lead-time); length of time for tier contracting, *i.e.*, time for subcontractor to start volume production; and length of time to develop alternate operations.
- Group B—Those whose loss would reduce production or operation because of a loss of productive equipment or parts.
- Group C—Those whose loss would not have an immediate effect on production or operation but would require additional manpower to maintain their function.
- Group D—Those whose loss would have no direct effect on production or operations.

Functional areas within each group should be ranked according to their vulnerability to damage. As the character of production or operation changes, the grouping should be revised to keep the ranking current.

Vulnerability Assessment.

Once the critical areas have been identified, the next step is to determine the degree of vulnerability to damage of each of these areas. The essence of vulnerability assessment is the type and magnitude of the emergency with which you might be faced. This could include civil disorders, sabotage, or other hostile or destructive acts. An effective plan is based on a sound estimate of the situation; *i.e.*, a determination of the categories of emergencies and the damage-causing factors to which the facility may be exposed.

Internal vulnerability arises from the location of, and conditions within, the facility itself. For instance, the location of a plant site may make it particularly vulnerable to damage from civil disorders, and the production of a particularly critical item may make it highly vulnerable to sabotage. External vulnerability is determined by the area in which the facility is located and includes geographic location; type of surrounding terrain; types, size, and proximity of neighboring industries; size, type, and proximity of nearby military installation; or a combination of any or all of these factors. For example, a facility, which in itself does not offer a profitable target to dissident groups or a saboteur, may be vulnerable if it is part of, or adjacent to, an industrial complex, vital installation, or population center which does offer a profitable target.

Operational Readiness.

Plans alone will not guarantee protection, but sound plans, in a state of operational readiness and properly executed, will minimize the extent of damage. Operational readiness implies appropriate but controlled publicity of the program among the employees, well trained personnel, proof-tested plans, and a continuing program of testing, evaluation and revision.

Planning is a continuing process. The planning effort must be deliberate, systematic and continuous if it is to be effective. This is achieved by phased planning with definite goals and target dates for achievement. There are three phases involved in developing an emergency plan. These are:

- **Phase 1. Estimate of the situation.** Based upon the results of the vulnerability assessment, reduction of vulnerability where applicable, and resources available, an estimate is made to provide data for preparation of the plan.
- **Phase 2. Development of the plan.** This phase is the application to specific situations, the facility's mission, and the concepts of disaster planning. It includes collecting resources, assigning and training personnel, and preparing, coordinating, and publicizing the planning documents. The extent of publicizing the plan will vary with the desires of management and the contingency against which the plan is to be applied.
- **Phase 3. Testing, evaluating, and revising the plan.** Upon completion of the plan, provisions must be made for testing (dry run) and actual implementation. This is the phase in which deficiencies and unrealistic features of the plan are corrected. It culminates the efforts previously made in preparation, training of personnel, and publishing the plan.

Major General Carl C. Turner, USA, is the Provost Marshal General, Department of the Army. Previously he was Provost Marshal, United States Army, Europe. He is well known in international police circles as an author and lecturer. He is a graduate of the National War College.

Developing the Plan

Effective planning requires a carefully formulated plan to mobilize plant personnel; an operational plan to direct their activities, and adequate logistical support for the duration of the disorders.

The matter of mobilizing or getting people together will be a time-consuming operation. It is one thing to assemble people and quite another to assure that they are given appropriate direction and leadership.

Prerequisite to industry's defense against the horrendous effects of a riot is close liaison with the local police department. This will keep you abreast of the social climate in your area and provide some advance warning of the imminence and possible magnitude of a disturbance. There might be a tendency to underestimate the possible danger of a sudden or slowly developing eruption. The police may not have all the information, but take what they have and use it well.

Effective command and control of your effort can best be accomplished by selecting a primary and alternate command control center. This center must be the focal point of your opera tions during the civil disorder. It is essential, then, that it be adequately staffed and equipped.

The most important asset of an industrial plant, during a riot or at anytime, is its employees. This is one area where communications plays an important role. A system must be developed for communicating with, or recalling, employees during non-operational periods. This, by and large, is a matter of telephonic communication. However, mass media communication such as radio and television should also be considered. It must be borne in mind that an adequate communications system is essential to plant security and continued operations. If you can't communicate, you can't operate. In addition to the notification aspect of communication, three other types must be considered. First is adequate external communications with the local police department, fire department and adjacent plants. Second is a well planned, workable internal system of communications. This system should provide instant and continuous communication within the plant. Third is an emergency back up to whatever primary system is used.

Considering that most of these riotous groups prefer to commit their crimes in the dark or by the light of burning buildings, a system of continuous perimeter and internal lighting is essential to plant protection. This requires analysis of the existing lighting to determine adequacy and continuity of illumination. In this regard, it is well to consider an emergency capability for illuminating the perimeter and critical internal areas.

The nucleus of facility defense is in-depth plant security. Every industrial plant in this country has some weakness in its security system. The achilles heel of your plant may not be known to you, but it may be known to persons who desire access to disrupt production or flow of the goods and services. A vulnerability assessment of the plant perimeter, entrances, exits and roof-top areas should reveal the weaknesses in this aspect of plant security. The regular guard force must be strengthened and trained to cope with the magnitude and peculiarities of civil disorder. Stringent procedures must be developed to assure continuous control of personnel, packages and vehicles entering and leaving the plant. Industry generally views the guard and the security force as the most non-productive segment of the operations. This thinking should be modified, because a good security force may well be the saving grace during an emergency. The necessity for good security cannot be over-emphasized. Ask yourself this question "Do I want the police to stop protecting my home and family in order to have an adequate force to protect my plant during a civil disturbance?" If you do not assume your obligation of adequately protecting your plant, you may force such a situation to exist.

Logistical Support

This leads us to the essential step of coordination and planning for logistical support. Two basic questions need to be answered. First: From whom might I need assistance? Second: What supplies and equipment might be needed to sustain my operations and people for the expected duration of the emergency?

In the first instance help from the community leaders and local public service organizations may be needed. Such assistance may be required in the form of fire fighting resources, electric power, water supply, transportation and medical aid, to mention a few. It is essential then, that your planning effort be coordinated with them. Such coordination must be effected now—tomorrow may be too late.

The second question is answered basically in terms of in-plant inventory. This addresses such things as fire fighting equipment, items needed for emergency repairs, transportation, food, medical supplies and water. Initial stockpiling of these items should be started now. Arrangements should also be made to assure immediate availability of additional supplies and equipment should the need arise.

Additional pre-emergency planning measures should include:

- Review of property and liability insurance against potential loss or obligation resulting from civil disorders.
- Planning an evacuation route away from the area of the disturbance.
- Checking procedures for protecting vital corporate records, cash and other valuable items.
- Providing all essential employees with identification cards with photographs and supplying samples of these to the police.

These are just a few of the many factors to be considered in preparing a plan to prevent or minimize damage to an industrial plant during a civil disorder. After all possibilities have been considered, the plan must be put in writing and disseminated only to management personnel and key employees who must then be briefed on the plan and their individual responsibilities in achieving its objectives.

These observations are certainly not the panacea for all the problems associated with such acts of violence and lawlessness. Rather, they should be viewed as the foundation for an effective industrial defense plan.

Industrial Emergency Plan Outline

Purpose

( ) Assure orderly and efficient transition from normal to emergency operations.
( ) Delegate emergency authority.
( ) Assign emergency responsibilities.
( ) Indicate authority by company executives for actions contained in plan.

Execution Instructions

( ) Appoint individual(s) to execute plan.
( ) Specify conditions under which plan may be partially executed.
( ) Specify conditions under which plan may be fully executed.
( ) Coordinate plan among all responsible individuals to assure sequence of execution.

Command and Control Center

The command and control center is the plant command post, the focal point for directing all emergency actions. For decentralized operations, all emergency actions should be coordinated through the central control center.
( ) Is location well protected?
( ) Can access be controlled with minimum manpower?
( ) Select alternate location.
( ) Prepare management succession list of executive and administrative personnel and key employees. Designate alternates.
( ) Assure that management continuity and emergency organization are in accord with state corporate laws and company charter or bylaws.
( ) Pre-publish company orders constituting emergency authority.

Planning Coordination (Mutual Aid)

( ) Coordinate plan with local and state officials.
( ) With police departments.
( ) With fire departments.
( ) With adjacent plants and business firms.
( ) With local utilities: power, telephone, transportation.
( ) With employee union officials.
( ) With local news media.

Communications

( ) Adequately cover plant area.

( ) Back-up primary system with two-way radios, walkie-talkies, field telephones, or megaphones (bull horns).

( ) Monitor local and state police radios.

( ) Monitor fire department radios.

( ) Monitor hospital and ambulance radios.

( ) Establish communications with adjacent plants and businesses.

( ) Establish communications with management and key employees.

( ) Train switchboard operators in emergency procedures.

( ) Establish emergency communications procedures.

Personnel

Emergency Notification

( ) Keep switchboards open and operators available.

( ) Designate male operators as alternates for females who may not report.

( ) Establish cascade system of notification for recall to work.

( ) Prepare reporting instructions.

( ) Designate reporting points, primaries and alternates out of emergency areas.

( ) Inform employees of locations and procedures.

( ) Instruct employees to report to points if normal routes to plant are closed.

( ) Plan transportation, *i.e.*, busses, trucks, company-owned or contracted.

( ) Coordinate mutual needs with other plants.

( ) Arrange police escort for emergency repair crews.

( ) Pre-select routes from reporting points to plant.

( ) Plan for escort of female personnel; consider car pools.

Training

( ) Survey secondary skills. Match with emergency requirements.

( ) Train personnel in emergency skills required, where necessary.

( ) Primary or secondary emergency skills. (Relate to survey of secondary skills.)

( ) Train for immediate internal or external emergency repairs.

Situation Briefings

( ) Brief employees on potential for civil disorder. Police can help.

( ) Brief on emergency plans. (Do this with caution. Do not create a scare program.)

( ) During disorder, brief employees daily on impact of riot on plant and community. Must be factual to dispel rumor and speculation.

( ) Prepare employees psychologically to remain on job: need for loyalty, self-restraint; act only as directed by management or police; report rumors to supervisors.

( ) Plan post-emergency recognition of exemplary performance.

( ) Explain impact of emergency on plant.

Evacuation

( ) Designate routes to evacuate buildings or plants.

( ) Inform employees of routes and procedures.

( ) Evacuate by departments (if practical).

( ) Designate primary and alternate exits away from emergency area.

Electric Power

( ) Coordinate plan with local power companies: transmission lines, transformer banks, alternate distribution lines.

( ) Provide emergency power for lighting and other essentials (not for full production).

( ) Generators, size, location, fuel, operators.

( ) Battery-powered equipment, flashlights, lanterns, radios, batteries.

Plant Security

Organizational Plans

( ) Develop plant security organization.

( ) Write security plans and procedures.

( ) Report promptly to FBI any actual or suspected acts of sabotage or espionage.

( ) Coordinate with local and state law enforcement agencies.

( ) Have supervisory personnel attend plant protection training.

Guard Force

( ) Organize guard force.

( ) Prescribe qualification standards.

( ) Train guards.

( ) Uniform guards.

( ) Arm guards (check with local officials the authority and legal liability during civil disturbance).

( ) Deputize guards, if necessary. (Check with local officials.)

( ) Assure guard force is on duty at all times.

( ) Issue written orders to guard force.

( ) Set up internal communications for exclusive guard force use.

( ) Plan auxiliary guard force for emergency: company employees, contract guards.

Perimeter Barriers

( ) Inspect security fence (or other barrier) regularly for proper maintenance.

( ) Park vehicles outside of security fence or wall (to reduce fire potential and minimize hazard of concealed explosive or incendiary devices).

( ) Light critical areas.

( ) Install intrusion detection devices.

( ) Post trespass warnings on all barriers.

( ) Use screening to protect lighting fixtures against rocks and other objects.

( ) Insure continuous lighting in parking lots and on ground floors.

Control of Entry

( ) Develop procedures for positive identification and control of employees.

( ) Give samples of identification media (photograph identification cards or badges) to local police. (Essential for crossing police lines or during curfew.)

( ) Guard force controls admittance to facility.

( ) Control movement and parking of vehicles.

Protecting Critical Areas

( ) Identify critical areas within plant.

( ) Enclose critical areas with physical barriers.

( ) Designate specific personnel who may have access to critical areas.

( ) Control admittance to critical areas.

( ) Protect unattended critical areas by locks or intrusion detection devices. (Rotate locks upon notification of impending emergency.)

( ) Develop a key control system.

( ) Develop package and material control procedures.

( ) Protect gasoline pumps and other dispensers of flammables. (Disconnect power source to electrically operated pumps.)

Arms Control

( ) Keep arms rooms locked and under 24-hour surveillance.

( ) Store ammunition in a separate locked location under 24-hour surveillance.

Personnel Security

( ) Conduct pre-employment investigations of applicants.

( ) Check personnel who are authorized access to critical areas.

( ) Brief employees on importance of plant security and vigilance.

Fire Prevention

( ) Post and enforce fire prevention regulations.

( ) Post signs showing location of fire hose connections.

( ) Insure that fire hose connections are compatible with local fire department equipment.

( ) Extend fire alarm system to all areas of facilities.

( ) Determine when fire department can arrive under conditions other than civil disorder: five minutes after report of fire? ten minutes?

( ) Provide secondary water supply for fire protection.

( ) Install fire protection equipment on-site. Maintain properly.

( ) Install mesh wire or screening material to protect roofs of buildings immediately adjacent to the perimeter from fire bombs, molotov cocktails, or other incendiary devices, if feasible. (Check with local fire department.)

( ) Organize employees into fire fighting brigades and rescue squads.

( ) Store combustible materials in well protected areas.

( ) Instruct employees in the use of fire extinguishers.

( ) Conduct fire drills periodically.

( ) Maintain good housekeeping standards.

( ) Implement recommendations in latest fire insurance inspection report.

Protect Vital Records

( ) Classify and protect vital corporate records, cash and other valuable items.

Property and Liability Insurance

( ) Review property and liability insurance against loss or obligation resulting from riots or other destructive acts.

Emergency Supplies

( ) Estimate duration of emergency.

( ) Pre-stock food, water and medical supplies because conditions may not permit procurement during emergency.

( ) Designate separate sleeping quarters for male and female employees.

( ) Provide sanitation facilities.

( ) Stock administrative supplies.

( ) Stock emergency repair tools, equipment and parts.

( ) Develop procedures for employees to purchase gasoline for automobiles from plant supply in case local stations are closed.

( ) Maintain sufficient inventory of empty 55-gallon drums to be filled with water or sand for use as barricades at entrances.

( ) Have on hand enough barbed wire to form a barrier directly in front of each row of 55-gallon drums. Concertina type wire is very effective.

( ) Maintain supply of panels or screen mesh to protect windows on ground floors.

Test the Plan

( ) Test individual parts of the plan.

( ) Test the entire plan.

( ) Test without prior announcement.

( ) Note weaknesses. Revise plan to include corrective actions.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Dr. Ralph R. Canter has been appointed Military Manpower Research Coordinator in the Office of the Asst. Secretary of Defense for Manpower and Reserve Affairs. He succeeds **Dr. Edmund E. Dudek,** who has returned to his position as Technical Dir., Naval Personnel Research Activity, San Diego, Calif.

Dr. Victor K. Heyman has been sworn in as Dep. Asst. Secretary of Defense for Southeast Asia Programs in the Office of the Asst. Secretary of Defense (Systems Analysis).

Don R. Brazier has been selected as Principal Dep. Asst. Secretary of Defense (Comptroller) succeeding **Joseph S. Hoover** who has retired after 38 years of government service.

Lt. Gen. John S. Hardy, USAF, has been named to succeed **Lt. Gen. Leighton I. Davis, USAF,** as Commandant, Industrial College of the Armed Forces, Washington, D.C. Gen. Davis will retire Aug. 1.

VAdm. Francis J. Blouin, USN, has been assigned to the Office of the Asst. Secretary of Defense (International Security Affairs) as Dir. of Military Assistance.

VAdm. Lloyd M. Mustin, USN, has been named Dir., Defense Atomic Support Agency, relieving **Lt. Gen. Harold C. Donnelly, USAF,** who will retire Aug. 1.

Selected for promotion to the rank of rear admiral, **Capt. Kenneth C. Wallace, USN,** has been reassigned as Mil. Asst. to Dep. Dir., Strategic and Space Systems, Office of Dir., Defense Research and Engineering.

Maj. Gen. John D. Lavelle, USAF, Dir., Defense Communications Planning Group, Defense Communications Agency, has been selected for promotion to lieutenant general.

Brig. Gen. Kenneth M. Gonseth, USA, has been assigned to the Defense Communications Agency, as Dep. Dir., Operations.

Brig. Gen. Richard M. Scott, USAF, has been assigned Dep. Dir. of the Defense Atomic Support Agency for Operations and Administration, succeeding **RAdm. James A. Dare, USN.**

Capt. Hugh D. Byrd, (SC), USN, has been designated to command the Defense Industrial Plant Equipment Center, Memphis Tenn., succeeding **Col. Fred H. Sitler, USAF,** who will retire.

G. C. Gardner Jr. has assumed duties as Comptroller of the Defense Communications Agency, succeeding **Thomas D. Moran Jr.** who has transferred to the Department of the Army as Dep. Controller.

Col. William B. Dudley, USAF, has been named Commander, Defense Contract Administration Services Region, Detroit, Mich.

Capt. Roderick F. MacPherson, (MC), USN, has been assigned as Dir. of Medical Material, Defense Personnel Support Center, Philadelphia, Pa.

Col. Charles F. Kane, USA, has been designated Coordinator of Off-Base Housing Services, Office of the Asst. Secretary of Defense for Manpower and Reserve Affairs.

Capt. Robert A. Schauffler, (SC), USN, has been assigned as Commander, Defense Contract Administration Services Region, Chicago, Ill.

DEPARTMENT OF THE ARMY

Joseph Romm has been sworn in as Dir. of Civil Defense, Office of the Secretary of the Army.

Brig. Gen. Michael Paulick has been designated Dep. Commanding General of the Army Test and Evaluation Command, Aberdeen Proving Ground, Md. He succeeds **Brig. Gen. James F. Hollingsworth.**

Col. William J. Heaser Jr. has been named Chief, Missile Div., Army Combat Developments Command, Fort Belvoir, Va.

Col. Arthur T. Surkamp has assumed duties as Project Manager, Night Vision, at Fort Belvoir, Va.

Leonard R. Ambrosini is the new Chief Systems Engineer at the Army Weapons Command, Rock Island, Ill.

Col. Royal K. Tanner, Dep. Commanding Officer, Army Combat Development Command Communications-Electronics Agency, Fort Belvoir, Va., has been assigned additional duty as the command's representative for Project Mallard.

DEPARTMENT OF THE NAVY

Adm. John S. McCain Jr., now serving as Commander-in-Chief, U.S. Naval Forces, Europe, has been selected as Commander-in-Chief, Pacific.

Lt. Gen. James M. Masters Sr., USMC, Commanding General, Marine Corps Development and Education Command, Quantico, Va., has retired. His replacement has not yet been announced.

Maj. Gen. William J. Van Ryzin, USMC, has been nominated for promotion to lieutenant general and assignment as Chief of Staff, Marine Corps Headquarters. Present Headquarters Chief of Staff, **Lt. Gen. Henry W. Buse Jr., USMC,** is being reassigned as Commanding General, Fleet Marine Force, Pacific. He will replace **Lt. Gen. Victor H. Krulak, USMC,** who is retiring.

RAdm. James F. Calvert has been selected as the 45th Superintendent of the U.S. Naval Academy. He will relieve **RAdm. Draper L. Kauffman.**

RAdm. Filmore A. Gilkeson will be the new Dir., Logistics Plans Div., Office of the Chief of Naval Operations.

RAdm. H. J. Kossler will relieve **RAdm. J. S. Dorsey** as Commandant of the Sixth Naval District and Commander of the Charleston, S.C., Naval Base in August.

Capt. John L. Burke, has relieved **Cdr. Robert H. Miller,** as Commanding Officer, East Central Div., Naval Facilities Engineering Command, Philadelphia, Pa.

Capt. Richard L. Cochrane has relieved **Capt. William L. Savidge,** as Dep. Commander of the Surface Warfare Directorate, Hq., Naval Material Command. In another change at NAVMAT, **Capt. Powell P. Vail** re-

lieved **Capt. James P. Jamison** as Dir. of the Technical and Systems Engineering Office.

Capt. Emery G. Story Jr. is the new Officer-in-Charge, Naval Ship Engineering Center, Philadelphia, Pa., Div.

The following captain assignments have also been announced by the Bureau of Personnel:

Capt. Rupert E. Graham, Comptroller, Naval Post Graduate School, Monterey, Calif.; **Capt. Bryce D. Inman**, Commanding Officer and Dir., Navy Underwater Sound Lab, Fort Trumbull, New London, Conn.; **Capt. Lester C. Maxwell**, Force Supply Officer, Amphibious Force, Pacific; **Capt. Philip S. McManus**, Commander, Naval Undersea Warfare Center, Pasadena, Calif.; **Capt. Elmer D. Anderson**, Dir., Office of Naval Research Branch Office, Chicago, Ill.; **Capt. Robert V. Hayes**, Commanding Officer, Naval Air Propulsion Test Center, Trenton, N.J.; **Capt. Justin A. O'Neil**, Commanding Officer, Naval Avionics Facility, Indianapolis, Ind.; and **Capt. Robert E. Vogel**, Commanding Officer, Naval Subsistence Office, Washington, D.C.

Cdr. Gordon L. Frey is the new Public Affairs Officer at the Pacific Missile Range, Point Mugu, Calif.

DEPARTMENT OF THE AIR FORCE

Gen. William W. Momyer has been named Commander, Tactical Air Command, Langley AFB, Va. He replaces **Gen. Gabriel P. Disosway** who retires Aug. 1.

Gen. Maurice A. Preston, Commander-in-Chief, U.S. Air Forces, Europe, will retire Aug. 1.

Gen. John D. Ryan has been assigned as Vice Chief of Staff, USAF, relieving **Gen. Bruce K. Holloway**, who will become Commander-in-Chief, Strategic Air Command, Offutt AFB, Neb., Aug. 1.

Lt. Gen. William K. Martin has been named to succeed **Lt. Gen. John W. Carpenter** as Commander, Air University, Maxwell AFB, Fla. Gen. Carpenter will assume new duties as Dep. Chief of Staff, Personnel, USAF.

Lt. Gen. Seth J. McKee, Commander U.S. Forces, Japan, and Commander, 5th Air Force, will be reassigned to duty as Asst. Vice Chief of Staff, USAF, effective on the retirement of **Lt. Gen. Hewitt T. Wheless** in July.

Lt. Gen. Jack J. Catton, Dep. Chief of Staff, Programs & Resources, USAF, has been reassigned as Commander, 15th Air Force, Strategic Air Command, March AFB, Calif., effective Aug. 1. Gen. Catton will be succeeded by **Maj. Gen. Lucius D. Clay Jr.**, who will be promoted to lieutenant general with the assignment.

Lt. Gen. Joseph R. Holzapple has been named Senior Air Force Member, Military Staff Committee, United Nations, in addition to his present duty as Dep. Chief of Staff, Research and Development, USAF.

Maj. Gen. Andrew J. Evans Jr., Dir. of Development, Office of Dep. Chief of Staff, Research & Development, USAF, will become Commander, Air Force Tactical Air Warfare Center, Eglin AFB, Fla., Aug. 1.

Brig. Gen. Robert L. Cardenas has been assigned as Commander, USAF Special Air Warfare Center, Eglin AFB, Fla.

Brig. Gen. Henry L. Hogan III is the new Dep. Dir., Office of Information, Office of Secretary of the Air Force. The assignment became effective July 1.

Col. Robert F. Long has been nominated for promotion to brigadier general and reassigned duty as Commander, Air Force Cambridge Research Laboratories, Office, Aeroscape Research, L. G. Hanscom Field, Mass.

Col. Maurice R. Reilly has been selected for promotion to brigadier general and reassigned as Dep. Dir. of Civil Engineering for Construction, Office of Dep. Chief of Staff, Programs and Resources, USAF.

The following assignments have been made in the Air Force Logistics Command (AFLC):

Maj. Gen. George M. Johnson Jr., Commander, Oklahoma City Air Materiel Area, Tinker AFB, Okla.; **Maj. Gen. Melvin F. McNickle**, Chief of Staff, AFLC Hq., Wright-Patterson AFB, Ohio; **Brig. Gen. Jowell C. Wise**, Vice Commander, Ogden Air Materiel Area, Hill AFB, Utah; **Col. James A. Bailey**, Dep. Commander, Warner Robins Air Materiel Area, Robins AFB, Ga., with promotion to brigadier general; and **Col. Robert E. Rochfort**, Dir., Procurement and Production, Oklahoma City Air Materiel Area, Tinker AFB, Okla.

The following assignments have been made in the Air Force Systems Command:

Col. Lawrence T. Gordon, Asst. Dir., Range Operations, Air Force Eastern Test Range, Patrick AFB, Fla.; **Col. Wayne G. Grooms**, Chief, Plans Office, Electronic Systems Div.; **Col. Dale E. Hansel**, Dir., Civil Engineering, Air Force Eastern Test Range, Patrick AFB, Fla.; **Col. William L. Marble**, Dir., Materiel, Air Force Missile Development Center, Holloman AFB, N.M.; **Col. Richard O. Ransbotton**, Dir., Flight Test, Aeronautical Systems Div.; and **Col. Richard P. Tipton**, Chief, Plans and Operations Office, Aeronautical Systems Div.

Systems Effectiveness Award Names Due

The Naval Air Systems Effectiveness Advisory Board (NASEAB) reminds all naval and Navy contractor activities that the deadline for nominations of individuals for the Rear Admiral L. D. Coates Award has been set at Aug. 2, 1968.

The annual award is presented to individuals who have made significant contributions to the development and application of systems effectiveness in naval air weapons.

Nominations should include a full description of the individual's contribution and sufficient supporting data. Send nominations to: **F. W. Snyder**, Executive Secretary, NASEAB, Code AIR–5205A, Naval Air Systems Command, Department of the Navy, Washington, D.C. 20360.

Primary criteria for the award are:

- Design or engineering actions which enhance performance, safety, availability, reliability, or maintainability of naval air weapons.
- Maintenance or service procedures which significantly improve performance, availability, or safety, and reduce manpower requirements.
- Logistic and support procedures which significantly enhance supply, support and facilities availability.
- Other actions or procedures which materially improve the management and control processes for system effectiveness.

The award was established in honor of Rear Admiral L. D. Coates, USN, who was instrumental in the founding of NASEAB, and served as the board's first chairman.

The Employed Electron— A Source of National Power

Address by Adm. Thomas H. Moorer, USN, Chief of Naval Operations, before the Armed Forces Communications and Electronics Assn. Annual Convention, Washington, D.C., May 14, 1968.

In the defense business, in my business, where life or death can be the end-product of a communications failure, the best equipment and maximum know-how become essential. It follows, without elaboration, that the job which the communications and electronics industry is doing is vitally important to the successful conduct of our country's military operations and to the security of America itself.

This afternoon I would like to speak to you briefly about our friend the electron and the communications he makes possible. I have titled my remarks, "The Employed Electron—A Source of National Power."

It is a rather fanciful analogy, but I think of the employment of the electron by people like you and me as I think of the basic construction of the atom and the electron's relation to it. As you know, the number of electrons circulating around a nucleus is equal to the number of positive charges on the nucleus. In like fashion, the number of electrons which we employ to serve the defense uses of a ship are equal to the number of positive charges which we get from you, the nucleus of the electronic and communication industry. It is a one-to-one ratio, which I am proud to say, has today produced outstanding results.

Taking the operator's view as the Chief of Naval Operations, I would like to give you some of my impressions of how and what we're doing today in the electronic field, discuss some of our problems, and some of our future challenges.

Before tackling our current status, I should perhaps, define "communications" in the year 1968.

As a young ensign I was taught that military communication was the "voice of command," and in that day it was perhaps no more than that. Today, communications is the ability to transmit information not just an order to "fire" or "hold your fire," "right rudder" or "left rudder." Rather, it is a total approach analogous to a "nerve system" of command. It comprises the total information impact which is the continuous sensing and reaction to the information from many systems. The flow is multidirectional. It is constant. It is dynamic. It's complexity, volume and context is at times beyond comprehension and at all times amazing.

To merely contemplate and present tactical and strategic concepts of what to communicate, to whom, and in "what mode" is today not just a technological challenge. It often has the most serious international political ramifications.

To the military officer, such as myself, the measure of success ultimately lies in the ability to manage change itself. Change constantly challenges our command and control systems in an open-ended battle of new techniques and new tools. The man who wins the battle is the man who keeps the electrons totally employed.

So much for what communications encompasses these days. Now I would like to shift to the what and how of our present operations.

Briefly, in the Navy we are currently involved with:

- Fully automated, computer controlled message centers ashore and afloat.
- Multi-channel equipment operating in both the Pacific and Atlantic Fleets.
- Seaborne communications bases—the USS Annapolis and USS Arlington—able to be deployed to any area of the world where there is a communication void or immediate need.
- Secure voice coverage—becoming a more mandatory and more common requirement daily.
- Lightweight shipboard terminals for use with satellites that have been tested and are now in limited operation. The potential is unlimited!

Thus, our computerized technological sophistication threatens total employment of the electron. With your help we are going to put every blessed one of them to work.

But we do have some problems. For example, we are just learning to become electronic extroverts—learning to improvise, to examine, learning to develop both near- and long-term solutions. We know now that we cannot look at only one system or one set of black boxes at a time. In every instance we must consider the system under examination as part of the full array of all systems which employ electrons and communicate information. This, of course, includes communciations systems, weapon systems, navigation systems, electronic warfare systems, countermeasure systems, etc. It is a tactical electron offensive which must be mounted, maintained and sustained if we are to overcome any sophisticated land, sea and air opponent in the future.

You have some problems. Each time you develop a new technique, a new procedure, or a new piece of equipment, you must be able to answer such questions as:

- How can this technological breakthrough better serve the defense communicator?
- How can it be related to systems already in operation?
- How can it be adapted to future changes?

Jointly, we have some problems, too. The very nature of a global sea service with a variety of missions presents certain peculiar command and control problems. I am proud to say that our Navy systems are among the most reliable and secure found anywhere in the world. The electronic changes I've seen in almost 40 years of naval service stagger the imagination.

When I reported to my first ship, the Salt Lake City, the term "tradeoffs" had not crept into our vocabularly. Logistics meant bullets, beans, and black oil—and you could almost

count the electrons in use. In fact, in the 1930s, active elements, *i.e.*, tubes, diodes, and other electronic components, on board the Salt Lake City numbered less than 100.

By comparison, today's destroyer calls for more than 30,000 active elements, and even though our ships are getting bigger, the integration of new systems and the instrumentation needed to support these systems is rapidly outstripping the ship's growth. The physical constraints which have been imposed as a result are a familiar problem to all of us.

Another problem of interesting comparison is repair parts. In 1948, only 20 years ago, a destroyer carried approximately 8,000 spare parts valued at $60,000. Today's missile frigate, a DLG, carries 22,000 spare parts valued at $900,000. Similarly, I checked on radiating components on board a modern carrier. There are 60 radiating type antennas mounted on the ship at various places and perhaps as many communications circuits making joint use of several of these antennas.

What has happened is, as I said before, that instead of communications simply becoming the "voice of command," it has now become the multiplex "nerve system" of command. Whereas word used to flow from a fleet unit to the fleet commander's headquarters for evaluation and filtering, now it can and must often go many echelons higher on an immediate basis. Critical data which has been collected, evaluated and digested world-wide goes instantly to the decision makers. With faster communications, the decision makers can be further removed from the operating area and as a result are now often operating directly from our nation's capitol in times of stress.

As with all mixed blessings, this high saturation of our units with electronic hardware brings maintenance, spare parts, and reliability problems. These are daily, changing and nagging problems, but despite them we have learned to admire our technology; we embrace it and encourage it as the only way we can get on with the job. As our tools become better, so does our control. We realize that with weapons of higher and finer caliber it is imperative that our control systems be better; that our data systems be better; and that we manage these systems more efficiently than in the past.

The Man—The Primary Element

Oddly enough, with better data and better communications we have the growing problem of processing the information, and displaying it in a form which can be digested by and acted upon immediately by mere man.

Despite the fact that changing hardware is progressing on a curve almost exponential in nature, unfortunately, some disciplines must progress less rapidly. For instance, a ship must last 20 to 30 years to successfully complete an active duty career. Obviously it is impractical, if not impossible, with rising costs and our accelerating technology, to change the ships as rapidly as progress demands. As a result, we find ourselves with ships that are somewhat behind the state of the art, though they are solidly engineered and are evolving toward an improved status. This will always be an unending battle which must be recognized as the nature of a navy and of ships.

The other element, which sometimes cannot keep up with the fast pace of our technology, is the primary element of a command and control system—which is the man. Understandably, the change in the human being has not been so exponential as the changes in technology. Yet, people are still the key. They are the ingredient to which we must tailor each and every hardware system. It is the sailor who must use the sophisticated equipment, and it is the sailor who must maintain it. If for one minute we forget this basic fact, then the most sophisticated equipment can become useless to the commander in the performance of his mission.

Adm. Thomas H. Moorer, USN

Because of these slower changes in the ships of the fleet and because of the time-consuming training cycle required to properly employ new equipment, defense communications, as far as the Navy is concerned, must continue to be evolutionary rather than revolutionary. New items which we introduce into a system must not only be compatible with existing equipment, they must also be engineered to work with newer items that may be in the offing five, six, or seven years hence. This poses problems for the developers of which they are painfully aware. But, as an operator, I can guarantee you that the word "evolution" is a key word as opposed to "a complete system change over." In an existing ship, a complete system changeover produces a traumatic effect.

I am not saying that we should keep our hardware simple. This is not realistic. I realize that equipment engineered to perform a complex job within the constraints imposed by space, weight, time and other factors, must, of necessity, be complex. I do submit, however, that while hardware may, of necessity, be complex, it need not be difficult to maintain or to operate and should be adaptable to future change and upgrading.

I know that extremely long life items are in the offing; that solid state technology promises relatively maintenance-free operations in the future, but when you go back to the numbers of components and active devices on a ship, we still will have a few problems. Athough it is ambitious, I think our goal must be to strive for equipment which requires no maintenance from the time it is installed until it is ready to be replaced.

When we reach this state of the art, it will mean that we can reduce and cut the long and costly training cycle for repair technicians, and solve the space problem presented by the thousands of spare parts which must presently be carried aboard ship. Presently there are over a million electronic components on the shelf in our Navy supply system. Eventually we must have more standardization and hopefully a zero electronics logistics business in which the equipment is maintenance free, and is ultimately turned in, intact, in exchange for an operable model.

One last broad and general problem which I would like to mention is the "real-time problem." I'm referring to

timeliness of delivery of new equipment to the Navy.

I am, of course, aware of the many mitigating circumstances on both the industrial and military side. The fact that either or both parties are perhaps delinquent to a degree does not reduce the severity of the problem that late delivery imposes. Too often, to the operator, it simply means he cannot get on with his job.

In some areas, such as electronic countermeasures, I can foresee where future operational requirements may demand, due to an opponent's electronic expertise, that we devise a system, design it, manufacture it, and install it in a matter of days in order to compete with the electrons of our enemies.

These are the problems we have in trying to keep the electron fully employed in the United States Navy. The challenges which they present are I think self-evident and are as great as any faced by any industry in any country.

Future Trends

Looking into the future, I sense the trend toward the evolution of a "data pipe" in and out of our ships, aircraft and shore stations. The so-called "information explosion" has already transcended our limited human capacity to absorb the different kinds of messages and data now cascading through our environment. We are rapidly approaching a state where we, as individuals, will be using the second deritive of information among themselves.

There are other trends which I believe will have a great deal of influence on the future of our military industrial team.

One is the trend toward larger contracts. I am not just talking dollars, but about the life of the contracts and the increased scope of what is bought in the way of spare parts and ancillary equipment. Another trend is that toward engineering of total systems. As a result of the total system concept, under which not only the original design and development but support ancillary items are involved, we can be confident that we will have fewer problems when we put a system into service. These are some of the things we are looking forward to in the very near future.

In the past, naval forces of varied compositions and types have either had to be deployed throughout the world, or be ready for immediate deployment. This is no less true today. The ability to maintain and support naval forces on the high seas worldwide, to command, control and coordinate them in tactical operations, to concentrate them quickly when and where they are needed requires the utmost efficiency in thought, data and information exchange.

Considering the versatility of Navy ships and their ability to perform varied roles under widely varying conditions, only one conclusion is possible. The effectiveness of American seapower is directly dependent on the total and effective employment of the electron—a source of national power.

By your presence here at this convention I am confident that you share my view that we must fully exploit the talent of the electronic and communications industry to produce new quality systems, on a reasonable cost. Your success is measured in terms of the best possible hardware for the serviceman on the front line.

His future security and our country's, in a very real sense, rests in your hands. I trust that as you keep him employed, you will also keep the U.S. electron busy in the future.

New Short-Range Sonar To Aid Submarine Rescue

A short-range sonar has been developed to enable the Navy's Deep Submergence Rescue Vehicle (DSRV) to pinpoint the escape hatch of a disabled submarine.

The problem was to accurately position a DSRV so that its transfer skirt could be lowered to envelop the topside escape hatch. A conventional television system was found to be practical only for gross positioning, and to be inadequate in muddy waters.

The short-range sonar projects two perpendicular beams, one fore and aft, and one port to starboard. Two displays in the rescue craft are used. One shows the profile of the hatch when scanned fore and aft; the other, port to starboard scan, shows the hatch and curvature of the submarine hull. Both displays also show the bottom of the transfer skirt.

Air Force Seeks New Airborne Weather Reconnaissance System

The Electronic Systems Division, Air Force Systems Command, is seeking letters from prospective contractors interested in providing specifications for an Airborne Weather and Reconnaissance System (AWARS).

Two or more firms will be awarded definition phase contracts prior to selecting a single firm to receive the acquisition contract.

The new system will provide Air Weather Service WC–130B/E and WC–135B aircraft with substantially increased capability to collect, process and relay meteorological data to ground stations.

AWARS is composed of eight meteorological subsystems, a data processing and display element, and a communications subsystem. Data to be collected includes temperature, pressure, dewpoint, wind velocity, clear air turbulence, ionospheric parameters, weather radar and selected data both above and below flight level.

The four-month definition phase contracts will be firm fixed price. Under the acquisition contract the prime contractor will be required to make, install and test one first article system aboard each type aircraft before equipping the remaining 22 weather planes.

Prospective bidders must possess experience and capability in meteorological sensor systems including weather reconnaissance radar, data processing, display and transmission systems. Bidders also must have capability in systems engineering, aircraft modification, fabrication, test, reliability, maintainability, human factors and quality assurance.

Firms interested in receiving requests for proposal must submit detailed prospectus indicating their experience and capabilities. The letter of interest and prospectus should not exceed five pages, one side, and should be sent to the Electronic Systems Division, Attention: ESKP, L. G. Hanscom Field, Bedford, Mass. 01730.

Problems and Promises of Weapons Acquisition Techniques of the 1960s

Commander William J. Ryan, SC, USN

In its earliest form, a contract was nothing more than a document expressing an agreement between someone who had something to sell, and someone who had the means to buy it. The objective was to exchange the seller's product for the buyer's money—a clean-cut, equitable transaction for both parties. From this simple beginning, purchasing—at least in the defense environment—has grown into a very complicated business. Probably its most sophisticated and most complex form is a major undertaking, called weapon system acquisition. This is how the bulk of the defense dollar is spent today.

The demand for acceleration in the development of new weapon systems in the late 1950s brought to light a number of difficult problems in the design, development and production of major weapon systems. Performance objectives were being missed. Unacceptable cost growth and schedule slippages plagued major defense programs. Although these were not necessarily new problems, their scale and impact were expanded tremendously by the size and complexity of the weapon programs themselves.

There seemed to be a fundamental lack of management discipline in both industry and Government. Because the only competition between firms for development work was essentially on a technical basis, there was a temptation for contractors to "buy in" at this stage by promising highly optimistic technical performance. Large scale weapon system development was undertaken before requirements were fully defined, and before it had been clearly demonstrated that the necessary technology existed. This work was mostly of the cost-reimbursement type, and often led to contractor inefficiencies and inequities, with the less efficient contractors being rewarded on the same basis as the highly efficient ones. Subsequent production contracts were often negotiated without competition.

The Government itself was in a situation where it could not rely completely on industry's proposals or on the contracts themselves for development work. On production work, the competitive discipline for outstanding performance was not present. The contracting organizations were still using the techniques developed years ago for buying beans and bullets. By 1961, fully 70 percent of the Navy's procurement dollars were being awarded under non-competitive conditions and one-third of this amount was tied up in cost-plus-fixed-fee contracts.

Clearly it was time for a change but what transpired during the next few years was more akin to a revolution. The inventory of responsive contracting techniques was expanded to combat specific problems:

- Incentive contracts were used extensively to shift financial risk from the Government to contractors. The percentage of defense dollars spent on cost-plus-fixed-fee contracts dropped sharply.
- Multiple incentive contracts were introduced concurrently to motivate contractors to optimize tradeoffs among performance, delivery and cost.
- The multi-year concept was introduced which allowed a buy of several years' requirements under circumstances where formerly repetitive, annual buys were made for the same equipment.
- Heavier reliance was placed on private ownership of facilities.
- Concept formulation and contract definition were developed to impart more discipline and realism into the development of requirements and specifications for new systems.
- The life-cycle costing concept was introduced to focus attention on the total cost of ownership, and force consideration of such things as maintenance and operating costs.
- The total package procurement method was developed to introduce competition at the earliest possible stage in the acquisition cycle. This allowed contracting for as much of the design, development, production and logistic support as could be defined at the outset.

Each of these techniques seemed to be more complicated than its predecessors, and required more skill and judgment in its application. In the case of all innovations, there is a trial and adjustment period which brings into sharp focus both the rewards and penalties involved. Weapon system acquisition is now reaching a point where some of the problems, as well as the benefits, of the new procurement methods and techniques can be recognized.

The first of these problems is something which is termed "disengagement."

Along with these forward steps in contracting techniques, a number of control systems in the form of schedules, reports, approvals, design reviews, etc., were established. Each of these was designed to accomplish at least one phase of an overall objective—to monitor contract performance from a technical, schedule, or cost viewpoint.

However, there are certain inherent

characteristics associated with controls. In volume, they usually create a stifling atmosphere; in their extreme, they promote a subtle shifting of responsibility from the controlled to the controller. There have been recent assertions from industry that the impact of these two undesirable by-products may be starting to outweigh the benefits expected when the controls were introduced.

There is probably some merit to these charges. If the Government wants industry to take responsibility for a product, it cannot logically insist on the authority to approve the drawings to which that product is to be built, or to direct the selection of certain suppliers for component parts, without severely diluting the contractor's authority. This approach also leads to the step-by-step approval of a product as it proceeds through development and production. A point is finally reached where the total effect of these approvals effectively relieves the contractor of all technical responsibility.

Extensive specification of design details can also make severe inroads on the contractor's discretionary design area, and effectively limit the degree of engineering expertise he can bring to bear on a given problem. Moreover, increased program costs brought on by poorly designed administrative control systems can easily override their benefits.

Wholesale abandonment by the Government of its role as steward, or the means necessary to carry out this role, is not the answer. The programs in which the Government and industry are mutually engaged are far too expensive, and the penalties for failure are much too harsh to permit such abandonment. In the final analysis, the Government, not industry, is responsible for the national defense, and the Government must have accurate and current visibility of the contractor's performance in order to react promptly if the success of a program is in jeopardy.

The ideal posture for the Government to assume is one of "hands off," but not "eyes off." Ways and means must be sought to monitor rather than control performance. The ultimate solution is not government "management," it is carefully structured contracts and control systems which encourage the contractor to manage his programs effectively.

A second problem area concerns the use of fixed-price contracts.

The Government, as the sole customer of the defense industry, is in a relatively strong position to establish the contractual framework in which the contractor will operate. Because of this "buyer's market," there has been a change in the general approach to defense contracting during the past five years. In simple terms, the Government is trying to contract under conditions which are as close to firm-fixed price as it can reasonably make them in each situation. The goal is to transfer responsibility and risk to the contractor with the expectation of a better product at lower cost. The Government would also like to see some of this cost reduction returned to the contractor in the form of increased profits, commensurate with the added risks he undertakes. Closer management attention, and more innovation in engineering and production by industry, are the means which will best achieve this objective.

One of the allegations frequently heard these days is that the Government is being a little too tough on industry. In its determination to gain the benefits from increased contractor risk, there are cases where the Government may have been a bit too aggressive—instances where fixed-price contracts were used for programs which entailed significant development, and the results were generally unsatisfactory for both buyer and seller.

Commander William J. Ryan, SC, USN, is Director of the Planning Branch, Procurement Policy and Planning Division, Naval Material Command, Washington, D.C. He has served with the Naval Reactors Division of the Atomic Energy Commission. A 1952 graduate of the U.S. Naval Academy, he holds an MBA degree from George Washington University.

A number of these instances have been reviewed, and they show a general pattern which can set the stage for real trouble.

First of all, the simple substitution of fixed-price or fixed-price-incentive contract language for cost-type terms does not cause an instantaneous change in the minds of the men who design and produce the hardware. For years a large portion of the defense industry sought to achieve technological and engineering goals under the comparatively loose confines of cost-type contracts. These efforts produced hardware which may not have entirely met these goals, but which was generally acceptable.

Now, when fixed-price concepts are applied to the same type of program, the Government must force strict adherence to each and every requirement spelled out or referenced in the contract. Goals under cost-type conditions become requirements under fixed-price terms. There is relatively little room in schedules and cost estimates for technical meandering, or for exploratory problem resolution, and contractors quickly get into trouble.

The second condition which sets the stage for fixed-price difficulties is, perhaps, an outgrowth of the first. This is the fact that prospective contractors don't seem to be giving the technical requirements of defense orders the kind of hard look they deserve. If contractors are going to succeed in a fixed-price atmosphere, the impact of each contract specification must be fully analyzed in terms of its technical and economic impact on the order. Prospective troubles must be identified as elements of risk and resolved at the outset. They cannot be glossed over on the basis of a unilateral assumption about their application and enforcement. This doesn't mean that the Government expects the contractor to define contract specifications, but the Government does have the right to expect that the contractor will gain a full appreciа-

tion of the job before he takes the contract.

First production orders seem to be the most fertile area for the kinds of troubles described here. These contracts are often awarded under fixed-price terms, and there is a good deal of engineering development which remains to be completed. Also, this job consists of translating paper into weaponry. This may be the toughest task of all. Producibility, at least under industrial conditions, has not been demonstrated. Each technical conclusion reached in the development phase must be proved on the production floor where mistakes are costly.

There may be particular problems associated with first production contracts for weapons developed in government laboratories. Both Government and industry have tended to assume in the past that such contracts should be relatively trouble-free. After all, development has been "completed," and producibility has been demonstrated during the first laboratory order for working hardware.

What has sometimes not been recognized is that development, at least its final engineering stages, is usually still proceeding, and that what little production has been completed was accomplished under laboratory conditions. The hardware was fabricated by highly skilled, experienced technicians, with laboratory equipment, under ideal conditions, and with close technical supervision. There is a significant transition from these idealistic conditions to a production atmosphere. Further, this transition is often complicated by the fact that a solid technical base for government-developed hardware may not exist in industry. In these cases, the contractor has no cushion of specifically related experience on which to fall back if he gets into trouble.

There is another aspect of major weapon system acquisition which is worth mentioning. These projects are usually massive undertakings for a single firm, entailing large commitments of facilities, labor and capital over an extended period. Failure may mean a major financial setback, or even the possibility of corporate disaster. Under these conditions, the selection of contractual framework is an extremely grave responsibility, and the Government must be careful to tailor its contracts to reflect a reasonable division of risk under each specific set of circumstances.

This should be possible now because the Government has a multitude of contractual approaches and techniques to arrive at the correct set of variables—technical performance, cost and schedule—for any task. The only remaining ingredients in the recipe for selecting the proper contractual approach are full recognition of each element of risk and balanced judgment.

The final problem is perhaps the biggest of all—the management of change in our current procurement environment.

The central feature of defense procurement demands that the Government must assume and maintain a posture of unusual flexibility. At the same time, however, it must adhere to firm contractual arrangements which are the backbone of a healthy government/industry relationship.

This divergence between the objectives of flexibility on one hand, and mutual commitment to a contractual document on the other, is so basic that there is no single, simple solution. Nevertheless, there are two things which can and must be done to alleviate the problem. First, the Government must select the type of contract with a full awareness and appreciation of the maturity of the system's design. Second, it must avoid unnecessary changes so that efforts can be concentrated on incorporating necessary improvement, regardless of the contractual arrangement.

This brief discussion of some of the government's current procurement problems does not mean that we in procurement are any less convinced that we are on the right track.

Our overall objectives are realistic and our methods are sound. In the final analysis, the current approaches to defense procurement are a distillation of the contributions of literally hundreds of experienced defense managers from both Government and industry. What is needed now is more concentration on sharpening the ability to use them selectively and correctly. In turn, a greater appreciation is needed on industry's part for the type of management attention and discipline these problems demand.

Testing Techniques

(Continued from Page 15)

of the data cannot be allowed to influence established procedures for drawing the conclusion. The ideal situation is seldom achieved and, frequently, certain factors are not found to have an apparent significant effect until the data is subjected to detailed scrutiny at the time it is being analyzed. These observations should be brought to the attention of the reader of the report to help him make his own evaluation of the conclusions, even though the observations or theories which have been formed have not been vigorously proved.

Another factor to consider in analysis is non-test data such as combat experience, analytical studies, and results of similar tests. This non-test data may provide possible explanation of unexpected significant events.

The Test Director

The final item to be covered is the special role of the test director. He must be capable of leading a group of individuals whose interests will probably be quite different. Consequently, there will be differences of opinions. The test director must be decisive for although he will have access to expert advice, he will be required to make the decisions. He must also acquire a comprehensive knowledge of the system being tested while maintaining an unbiased attitude towards the test. Once the test begins, the test director must deal only in facts. He must be consciously on guard not to influence the course of testing to achieve a desired result.

The magnitude and complexity of the test effort on today's weapon and support systems require dedicated teamwork and exceptionally competent management.

Value Engineering Guide Available

A brochure titled "Value Engineering—An Industry Guide for Contractors" has been published by the Army Aviation Materiel Command (AVCOM), St. Louis, Mo., as an aid to defense contractors.

Copies may be obtained from the Small Business Advisory Industrial Assistance Office, AVCOM, P.O. Box 209, Main Office, St. Louis, Mo. 63166, Telephone: (314) AM 8-3177, 3905 or 2688.

First Production Contract Signed for Sentinel System

The Army has signed an initial product contract with the Western Electric Co. for the buildup of a manufacturing capability, as well as production of some components to be used in the deployment of the Sentinel anti-ballistic missile system.

The initial contract for $85,480,628 will cover the period from April 1 to Sept. 30, 1968. A longer term contract extension will be signed prior to completion of the present pact.

The contract was signed by the Contracts Office of the Sentinel System Command, Redstone Arsenal, Ala., which will administer the contract.

Sentinel is an Army-developed ballistic missile defense system which will be deployed as a defense against the potential threat of Communist Chinese intercontinental ballistic missile attack.

Total production and deployment acquisition cost of the system is expected to be about $5 billion.

Under the contract, production will be started on electronic circuits and related items for the system's radars and computers. Many of these will be high volume components which will require a lengthy production period.

Acquisition of special tools and test equipment, required in the manufacturing process, will begin during the current contract period.

The contract also calls for the contracting firms to provide pre-production services such as design work on production facilities; mass production engineering studies; plans for training system personnel; procedures for quality control, component testing and system maintenance and development of procedures for compiling management data.

Western Electric, as the Army's prime contractor for the Sentinel production program, will produce some system hardware in its own facilities. A major function of the company, however, will be overall system management and intregration of production and installation efforts by other system contractors.

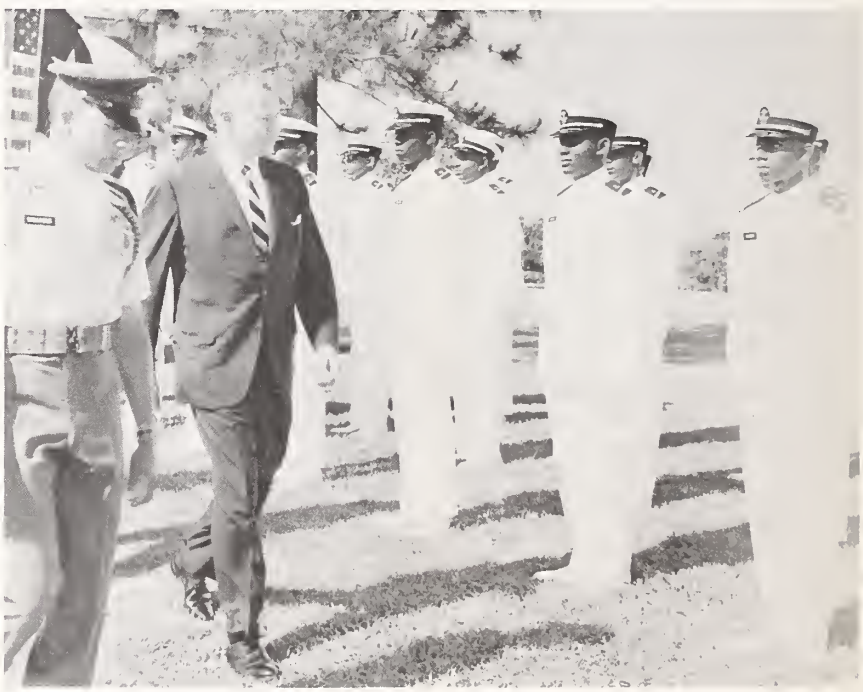
Western Electric will also continue as prime contractor for the Sentinel research and development program which will continue at a high priority level. Bell Telephone Laboratories directs the Sentinel technical development program for Western Electric.

The initial production contract will be shared by nine firms, including: Western Electric which will receive $28,000,000; McDonnell-Douglas Corp., Santa Monica, Calif., developer of the Spartan missile, $6,300,000; Martin-Marietta Corp., Orlando, Fla., developer of the Sprint missile, $2,800,000; General Electric Co., Syracuse, N.Y., developer of the Perimeter Acquisition Radar, $1,700,000; Raytheon Co., Wayland, Bedford, Waltham and Andover, Mass., developer of the Missile Site Radar, $19,000,000; Lockheed Electronics Co., Los Angeles, Calif., data processing equipment, $1,700,000; Radio Corp. of America, Harrison, N.J., $5,000,000; Motorola Corp., Phoenix, Ariz., $5,000,000; and Texas Instrument, Inc., Dallas, Tex., $5,000,000, production of integrated circuit packages

DSA Introduces Automatic Data Processing in DCASRs

A new system of automatic data processing is being introduced in the Defense Contract Administration Services Regions (DCASRs) of the Defense Supply Agency for the management of defense contracts across the United States.

The computers will be used to process the data on 270,000 contracts for materials and services of the Army, Navy, Air Force, the Defense Supply Agency and the National Aeronautics and Space Administration. The data concerns contractor progress and status surveillance, quality assurance, accounting services, invoice control and timely payment, packaging requirements, transportation, and other functions essential for contract completion in accordance with specifications.



FUTURE NAVY OFFICERS. Under Secretary of the Navy Charles F. Baird inspects an honor guard of Naval Reserve Officer Training Corps cadets at Prairie View A&M College, Prairie View, Tex. Purpose of the visit was to officially establish an Navy ROTC unit at the Texas school. The new unit is the Navy's first at a predominantly Negro college.

Air Force/Industry Cost Reduction Workshop To Be Held in Los Angeles, Oct. 3, 1968

The Fourth Annual Air Force/Industry Cost Reduction Awards Ceremony and Workshop will be held at the International Hotel, Los Angeles, Calif., on Oct. 3, 1968. The purpose of this annual event is twofold: To foster better understanding, continued cooperation, and effective participation in developing improvements in the operation of the Air Force/Industry Cost Reduction Program; and to recognize outstanding contributions by members of industry.

The program planned for the 1968 workshop will include a keynote address by Hugh Witt, Deputy Assistant Secretary of the Air Force (Installations and Logistics). There will be three working panels at which ideas and problems will be discussed on the following aspects of the Air Force Cost Reduction Program: Value Engineering Change Proposals, Organization for Cost Reduction and Motivational Programs, and Stimulating Sustained Cost Reduction Activity.

A luncheon is planned and a banquet in the evening will feature the awards ceremony. The awards, which are given annually, recognize contractor employees who have submitted the most significant validated cost reduction savings suggestions during the preceding fiscal year. A maximum of 20 ideas will be selected.

Planning for the event is being conducted by a steering committee with industry and Air Force membership under the co-chairmanship of James M. Abbett, Lockheed Missiles and Space Co., 1111 Lockheed Way, Sunnyvale, Calif. 94088; and H. H. Huber, Plans and Management Group, Directorate of Procurement Policy, Headquarters, U. S. Air Force, Washington, D. C. 20330.

Other members of the 1968 Air Force/Industry Cost Reduction Steering Committee are: Robert K. Floyd, General Dynamics Corp.; Kenneth W. Hornor, Northrop Corp.; B. J. Kerrigan, General Electric Co.; Kenneth C. MacDonald, General Motors Corp.; James McKechnie, Martin-Marietta Corp.; Mel A. Running, The Boeing Co.; John Snider, Hughes Aircraft Co.; R. L. Strode, Avco, Corp.; Harry Tumidajewicz, Aerojet-General Corp.; W. S. Urquhart, North American Rockwell Corp.; and V. B. Von Sonn, McDonnell-Douglas Corp. Air Force members are: Colonel W. C. Robinson and Major Kaye H. Herzer, Headquarters, U. S. Air Force; Lieutenant Colonel R. K. Dewberry, Headquarters, Air Force Systems Command; Major J. S. Prowell, Headquarters, Air Force Logistics Command; and H. J. McKay, Air Force Contract Management Division.

The 1967 workshop and awards ceremony held in Boston, Mass., last fall, attended by 181 members of the Air Force-industry team, honored 26 aerospace industry employees for cost reduction efforts. Since the initial award ceremony in 1965, 66 individuals representing industry have received award certificates from the Air Force. The 26 individuals representing defense contractors, who received recognition for significant cost reduction achievements in FY 1967, are listed below:

W. H. Cartland
H. A. Faber
Lockheed Missiles and Space Co.
Savings: $202,100

R. M. Debevec
North American Rocketdyne Div.
Savings: $6,000

Todd Derlachter
Sargent-Fletcher Co.
Savings: $29,019

Emile Deveau
John C. Rolfs
General Precision, Inc.
Savings: $5,812

H. S. Ferguson
Kenneth R. Thomas
McDonnell-Douglas Corp.
Savings: $21,450

V. E. Fortuna
American Electric, Inc.
Savings: $432,472

Alan J. Goehle
Atlantic Research Corp.
Savings: $23,600

William I. Green
Hughes Aircraft Co.
Savings: $603,385

Glenn D. Hart
Robert J. Stefing
Aerojet-General Corp.
Savings: $3,355,800

Thomas F. Hauck
Lear-Siegler, Inc.
Savings: $152,563

Lee Holmes
General Dynamics Corp.
Savings: $444,900

George C. Johnson
Ashok Nagrani
Lockheed-Georgia Co.
Savings: $513,662

Roger L. Johnson
General Motors A C Electronics Div.
Savings: $18,600

A. A. Macias
Martin-Marietta Corp.
Savings: $57,477

Bob G. McCullough
United Technology Center
Savings: $23,000

Jack B. Phelps
Thiokol Chemical Corp.
Savings: $14,500

W. Stephen Sellars
Thomas W. Tansey
Avco Corp.
Savings: $57,800

Carl Sollami
Sylvania Electric Products, Inc.
Savings: $23,900

Edward K. Tyler
General Electric Co.
Savings: $31,920

J. White
Fairchild-Hiller Corp.
Savings: $2,191

The total DOD contractor savings increased from $811 million in FY 1965 to $972 million in FY 1967. Today, 85 parent companies, with 211 plants and divisions, are active in the Defense/Contractor Cost Reduction Program, (see listing in *Defense Industry Bulletin*, April 1968, page 13). All defense contractors are encouraged to participate in the program and invited to report their savings to DOD on a semi-annual basis. Information and detailed guidance for such participation are available in the Defense Contractor Cost Reduction Program Handbook (DOD 7720. 12–H).

The Air Force headquarters point of contact on matters relating to the Cost Reduction Program is: Major Kaye H. Herzer, Plans and Management Group, Directorate of Procurement Policy, Headquarters, U. S. Air Force, Room 5C 260, The Pentagon, Washington, D. C. 20330, Telephone (202) OXford 5–2766 or OXford 7–8280.

President Reports Plans, Progress in Marine Science

"Marine Science Affairs—A Year of Plans and Progress," is the title of President Lyndon B. Johnson's second annual report on Marine Science Affairs, submitted to Congress March 11.

In the report, the President emphasized two points—international cooperation in the study and use of the oceans, and strengthening the domestic program of the United States to enhance the use of the oceans, coastal waters, and the Great Lakes.

The 228-page report, which is illustrated and contains significant charts and tables, is available for purchase for $1 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Pinnochio

The Plane With a Nose That Grows

A C–131 cargo plane, nicknamed Pinnochio because it has a nose that grows, is being developed by the Air Force as a variable stability aircraft. It will be used to test flight handling characteristics of advanced aircraft.

With a second cockpit located below and forward of the main cockpit, Pinnochio can simulate flying conditions of such advanced aircraft as the Advanced Manned Strategic Aircraft (AMSA), the Supersonic Transport (SST), and the huge C–5A cargo and passenger aircraft.

Officially called Total In-Flight Simulator (TIFS), Pinnochio is equipped with six independent controls and can be made to fly the same way as the aircraft being studied. This is done by adjusting the distance between the evaluation pilot's seat in the second cockpit and the center of gravity.

For example, to test the AMSA, a generalized cockpit with instruments would be attached to the basic nose of the C–131 aircraft. For the SST, a longer nose would be added to simulate its extended length. Each attachment would have an instrument panel and display system peculiar to the plane being simulated. With the nose of the SST installed, the TIFS extends some 20 feet beyond its regular cockpit.

The C–131 TIFS aircraft can be used to investigate flight control problems of existing aircraft, to determine requirements for new aircraft, and to train pilots to fly advanced aircraft. Emergency flight conditions can be simulated safely, since normal control of the C–131 is under command of the safety pilot at all times.

The variable stability system of the C–131 will control not only normal aerodynamic surfaces, such as ailerons, elevators and rudder, but also engine thrust for direct control of fore and aft forces; lift flaps for direct control of lift; and side force surfaces on the wings, in the form of unusual vertical fins, for direct control of lateral forces.

The simulator will carry flight evaluation pilots in the extended cockpit, safety pilots in the regular cockpit, observers in the cabin, and test engineers to operate the digital tape recording system and the analog computer.

Primary use of the TIFS would be as a flying laboratory to test various controls, instruments and aircraft configurations. Research using TIFS would enable the Air Force to save money, while determining in advance the correct design and instrumentation needed for an advanced aircraft.

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS

(Dollars in Millions; Manpower in Thousands; Quarters by Calendar Year)

	1966 I	II	III	IV	1967 I	II	III	Oct	Nov	Dec	IV	1968 Jan	Feb	Mar	I	Apr
I. *Military Prime Contract Awards*																
Aircraft	$ 1,945	$ 2,989	$ 2,696	$ 2,262	$ 2,102	$ 3,049	$ 2,513	$ 1,249	$ 578	$ 805	$ 2,632	$ 442	$ 530	$ 574	1,546	$ 834
Missile & Space Systems	1,040	987	1,314	861	1,230	1,166	1,580	323	429	316	1,068	348	470	393	1,211	327
Ships	355	491	876	239	679	407	417	153	147	110	410	109	79	236	424	79
Weapons & Ammunition	555	1,486	692	940	818	1,769	1,104	454	451	439	1,344	226	416	383	1,025	423
Electronic & Communications Equip.	918	1,574	666	915	971	1,848	816	272	247	305	824	359	264	248	871	336
Other Hard Goods	843	1,842	660	1,029	915	1,564	785	252	153	248	653	246	348	306	900	314
Soft Goods	709	922	1,078	989	638	652	1,056	175	118	198	491	437	140	202	779	219
Construction	207	392	198	150	232	626	232	56	44	113	213	61	53	67	181	39
All Other	1,406	1,963	2,356	1,639	1,605	1,987	2,335	522	486	649	1,657	457	470	534	1,461	519
Total (Excl. Work Outside U.S.)	7,978	12,646	10,536	9,024	9,190	13,068	10,838	3,456	2,653	3,183	9,292	2,685	2,770	2,943	8,398	$3,090
Total Seasonally Adjusted	8,703	10,144	10,716	10,149	10,171	10,667	10,961	3,665	3,308	3,479	10,413	2,887	3,445	3,124	9,456	3,488
Work Outside U.S.	521	1,195	856	672	453	834	891	193	117	145	455	288	139	134	561	157
II. *Gross Obligations Incurred*																
Operations	8,326	9,604	10,426	9,702	10,229	11,435	11,224	3,776	3,374	3,663	10,812	3,798	3,435	3,487	10,721	
Procurement	4,374	8,539	5,368	5,276	5,113	8,948	6,154	2,699	1,717	1,876	6,292	1,784	1,865	2,003	5,652	
Other	2,429	3,470	3,453	2,230	2,519	3,510	3,420	860	665	669	2,194	863	792	553	2,206	
Total	15,129	21,613	19,247	17,208	17,861	23,893	20,798	7,335	5,755	6,208	19,298	6,445	6,092	6,043	18,579	
III. *Gross Unpaid Obligations Outstanding*																
Operations	3,828	3,777	4,792	5,024	4,644	4,513	5,267	5,270	5,050	5,150	5,150	5,127	5,127	4,975	4,975	
Procurement	18,023	22,119	22,736	23,173	22,780	25,248	24,925	25,423	24,982	24,856	24,856	24,197	24,024	24,127	24,127	
Other	5,625	5,942	8,026	7,253	6,996	7,506	7,971	7,854	7,609	7,360	7,360	7,329	7,303	7,038	7,038	
Total	27,476	31,838	35,554	35,450	34,420	37,267	38,163	38,547	37,641	37,366	37,366	36,653	36,454	36,140	36,140	
IV. *Net Expenditures*																
Operations	7,689	9,076	8,968	9,087	10,002	10,731	10,001	3,641	3,456	3,397	10,494	3,550	3,273	3,416	10,239	
Procurement	3,651	3,886	4,392	4,264	5,074	5,282	6,060	2,005	1,890	1,704	5,598	2,274	1,913	1,680	5,867	
Other	2,757	2,647	2,484	3,092	3,160	2,001	3,047	790	847	724	2,363	1,153	1,032	1,025	3,210	
Total	14,097	15,609	15,844	16,443	18,236	18,014	19,108	6,436	6,194	5,825	18,455	6,977	6,218	6,121	19,316	
V. *DOD Personal Compensation*																
Military	3,181	3,249	3,551	3,606	3,624	3,646	3,842	1,264	1,297	1,411	3,972	1,338	1,339	1,338	4,014	
Civilian	1,937	2,015	2,105	2,135	2,170	2,248	2,271	773	772	787	2,332	828	774	773	2,375	774(p)
Total	5,118	5,264	5,656	5,741	5,794	5,894	6,113	2,037	2,069	2,198	6,304	2,166	2,113	2,111	6,389	
VI. *Outstanding Payments*																
Advance Payments	66	79	90	83	92	80	110				134				128	
Progress Payments	4,402	4,346	4,750	5,461	5,981	6,765	7,179				7,491				7,681	
Total	4,468	4,425	4,840	5,544	6,073	6,845	7,289				7,625				7,809	
VII. *Strength (Manpower)*																
Military	2,969	3,094	3,229	3,334	3,371	3,377	3,412	3,416	3,412	3,398	3,398	3,427	3,440	3,467	3,467	
Civilian	1,088	1,138	1,184	1,230	1,268	1,303	1,274	1,277	1,277	1,271	1,271	1,267	1,265	1,266	1,266	1,267(p)

P = Preliminary

Note: Open spaces for Indicators other than No. VI indicate information not available at time of publication. Indicator No. VI information available only on a quarterly basis. Totals may not add due to rounding.

Directorate for Statistical Services
OASD (Comptroller)
May 29, 1968

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of May 1968:

DEFENSE SUPPLY AGENCY

3—**Pettibone-Mulliken Corp.**, Washington, D.C. $1,550,140. 100 fork lift trucks. Defense General Supply Center, Richmond, Va. DSA 400–68–C–1818 MA 309.

—**West Point Pepperell, Inc.**, New York, N.Y. $1,392,891. 1,495,000 linear yards of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2223.

4—**Damascus Hosiery Mills**, Damascus, Va. $1,164,083. 1,911,640 pairs of men's socks. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2236.

—**Reflective Laminates**, North Hollywood, Calif. $1,106,245. 10,445 body armor plates and 7,224 body armor plates. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2230.

7—**West Point Pepperell, Inc.**, New York, N.Y. $1,200,875. 650,000 linear yards of ballistic nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2193.

—**Deering Millikin, Inc.**, LaGrange, Ga. $1,062,650. 530,000 yards of ballistic nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2192.

—**Riegel Textile Corp.**, New York, N.Y. $2,193,844. 1,873,000 linear yards of wind resistant cotton poplin cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2225.

10—**Gulf States Asphalt Co.**, Houston, Tex. $1,239,300. 4,860,000 gallons of asphalt soil binder. Defense Construction Supply Center, Columbus, Ohio. DSA 700–68–C–7302.

13—**Endicott Johnson Corp.**, Endicott, N.Y. $2,729,579. 350,000 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2309.

—**Safety First Shoe Co.**, Nashville, Tenn. $2,618,113. 334,110 pairs of tropical combat boots. Defense Personnel Support Center, Phildelphia, Pa. DSA 100–68–C–2310.

—**Bata Shoe Co.**, Belcamp, Md. $1,715,278. 216,030 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2311.

—**Addison Shoe Corp.**, Wynne, Ark. $3,090,000. 400,000 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2308.

14—**Aluminum Co. of America**, Pittsburgh, Pa. $12,895,007. 44,388,000 lbs. of aluminum powder. Defense General Supply Center, Richmond, Va. DSA 400–68–C–6094.

—**Consolidated Bag Co.**, Philadelphia, Pa. $1,727,779. 5,208,000 containerized acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400–68–C–6095.

—**Dowling Bag Co.**, Valdosta, Ga. $2,208,000. 7,000,000 containerized acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400–68–C–6097.

—**Crowley Industrial Bag Co.**, Crowley, La. $4,598,835. 13,950,000 containerized acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400–68–C–6096.

—**B. G. Colton & Co.**, New York, N.Y. $1,911,670. 1,672,503 linear yards of wind resistant cotton and nylon sateen cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2320.

—**Vitro Minerals Corp.**, New York, N.Y. $1,426,364. 225,334 tons of coal. Defense Fuel Supply Center, Alexandria, Va. DSA 600–68–C–1784.

—**Usibelli Coal Mine, Inc.**, Usibelli, Alaska. $1,169,640. 194,940 tons of coal. Defense Fuel Supply Center, Alexandria, Va. DSA 600–68–C–1784.

17—**B. G. Colton & Co.**, New York, N.Y. $2,132,546. 1,433,645 linear yards of water repellent oxford cloth, cotton warp, nylon filling. Defense Personnel Support Center, Philadelphia, Pa., DSA 100–68–C–2329.

20—**L. D. Lawson & Co.**, Long Beach, Calif. $9,599,184. 308,160 cases of ration supplement sundries pack. Defense Personnel Support Center, Philadelphia, Pa. DSA 134–8–C–249A1.

—**Kings Point Industries**, Fayetteville, N.C. $2,137,500. 150,000 body armor fragmentation protective vests with collars. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2375.

21—**Texaco, Inc.**, New York, N.Y. $1,018,855. 9,290,000 gallons of gasoline. Defense Fuel Supply Center, Alexandria, Va. DSA 600–68–D–1974.

—**Winfield Mfg. Co.**, Winfield, Ala. $2,358,957. 985,583 pairs of men's cotton poplin trousers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2357.

—**Brownwood Mfg. Co.**, Dallas, Tex. $1,515,250. 500,000 pairs of men's cotton poplin trousers, Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2358.

22—**Consolidated Bag Corp.**, Philadelphia, Pa. $7,245,733. 20,000,000 acrylic sandbags. Defense General Supply Center, Richmond, Va. DSA 400–68–C–6095–P001.

24—**West Point Pepperell, Inc.**, New York, N.Y. $1,850,000. 1,000,000 yards of ballistic nylon cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2410.

—**Allen Overall Co.**, Monroe, N.C. $3,365,000. 700,000 men's wind resistant cotton coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2416.

27—**American Oil Co.**, Chicago, Ill. $1,018,696. 3,949,500 gallons of gasoline, 3,177,000 gallons of diesel fuel and 395,000 gallons of number 4, 5 and 6 fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600–68–D–1883.

—**Gulf Oil**, Houston, Tex. $2,681,043. 16,366,000 gallons of gasoline, 1,855,000 gallons of diesel fuel and 395,000 gallons of number 4, 5 and 6 fuel oils. Defense Fuel Supply Center, Alexandria, Va. DSA 600–68–D–1923.

—**Riegel Textile Corp.**, New York, N.Y. $3,423,010. 3,531,051 square yards of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa.

28—**Gentex Corp.**, Carbondale, Pa. $1,106,076. 16,211 combat vehicle crewmen's helmets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2421.

—**Warren Pumps, Warren**, Mass. $1,030,000. Rotary and centrifugal pumps. Defense Construction Supply Center, Columbus, Ohio. DSA 700–68–C–9550.

29—**D'Rossi & Son Co.**, Vineland, N.J. $2,650,500. 150,000 men's wool serge coats. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–2495.

31—**I.B.M.**, Washington, D.C. $1,081,470. $1,081,470. Purchase of previously leased automatic data processing equipment at the Defense Construction Supply Center, Columbus, Ohio, and at the Defense Depot, Ogden, Utah. Defense Supply Agency, Alexandria, Va. DSAHOO–68–F–0019.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting agency—Contract number.

DEPARTMENT OF THE ARMY

1—**Ford Motors**, Dearborn, Mich. $3,801,748. 2,424 sedans. Claycomo, Mo. and Lorain, Ohio. Tank Automotive Command, Warren, Mich. DA–AE07–68–C–2173.

—**Whitaker Corp.**, Saugus, Calif. $1,469,358. Igniters for 2.75-inch rocket motors. Picatinny Arsenal, Dover, N.J. DA–AA21–68–C–0674.

2—**Standard Construction Co.**, Columbus, Ohio. $1,221,704. Work on the John Hollis Bankhead Lock and Dam Project. Tuscaloosa County, Ala. Engineer Dist., Mobile, Ala. DA CW01–68–C–0094.

—**Chrysler Motors**, Detroit, Mich. $1,208,582. 342 trucks/truck chassis. Warren, Mich. Tank Automotive Command, Warren, Mich. DA AE07–68–C–2235.

—**Northrop Carolina, Inc.**, Swannanoa, N.C. $2,214,300. CS–1 chemical agent. Edgewood Arsenal, Edgewood, Md. DA–AA15–68–C–0482.

3—**Blount Bros.**, Montgomery, Ala. $6,840,000. Construction of a 1200-foot lock on the Ohio River near Brookport, Ill. Engineer Dist., Louisville, Ky. DA CW27–68–C–0157.

—**General Motors**, Detroit, Mich. $7,759,678. Metal parts for 105mm projectiles. St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0066.

—**Sundt Co.**, Tucson, Ariz. $5,222,206. Construction of a 50-foot extension to mobile service tower; inclosure to top of tower; enlargement of flame bucket; provide a new umbilical tower; provide propellant storage facility; and modify service building at the Western Test Range, Vandenberg AFB, Calif. Engineer Dist., Los Angeles, Calif. DA–CA09–68–C–0107.

—**Chamberlain Mfg. Corp.**, Elmhurst, Ill. $1,168,500. Metal parts for 105mm projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0052.

—**Temco, Inc.**, Nashville, Tenn. $1,380,301. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0206.

—**Wythe Tool & Machine Co.**, Brooklyn, N.Y. $1,365,000. Links for 7.62mm ammunition. Frankford Arsenal, Philadelphia, Pa. DA AA25–68–C–0630.

—**Ghemm & Marson Construction & Engineering Co.**, Fairbanks, Alaska. $6,535,000. Construction of a composite Aircraft Control and Warning Building consisting of facilities for operation, maintenance, administrative, messing and housing, recreational and other support. Cape Lisbourne, Alaska. Alaska Engineer Dist. DA CA–85–68–C–0069.

6—**General Electric**, Burlington, Vt. $1,429,631. Aircraft machine guns, pods, feeder delinkers, repair parts and ancillary equipment. Army Weapons Command, Rock Island, Ill. DA AF03–67–C–0028.

—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $1,445,094. Track shoe assemblies for light howitzers. St. Marys, Ohio. Tank Automotive Command, Warren, Mich. DA AE07–68–C–2389.

—**Armstrong Rubber Co.**, West Haven, Conn. $2,210,910. 39,000 pneumatic truck tires. Hanford, Calif. and Des Moines, Iowa. Tank Automotive Command, Warren, Mich. DA AE07–68–C–2893.

—**Smith & Wesson**, Springfield, Mass. $1,020,523. 38 cal. revolvers. Army Procurement Agency, New York, N.Y. DA AG–25–68–C–1242.

—**Magnavox Co.**, Urbana, Ill. $3,626,241. Gun direction computers and data storage magnetic disks. Army Procurement Agency, Chicago, Ill. DA AA–5268–C–0429.

—**Northrop Corp.**, Needham Heights, Mass. $2,349,140. Fin assemblies for 81mm mortars. Army Procurement Agency, Chicago, Ill. DA AA09–68–C–0251.

—**I.B.M.**, Gaithersburg, Md. $1,997,000. Data processing system for military logistics. Army Electronics Command Procurement Office, Washington, D.C. DA AB07–67–C–0408.

7—**Chamberlain Mfg. Co.**, Elmhurst, Ill. $10,162,909. Metal parts for 175mm high explosive projectiles. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09–67–C–0361.

—**Studebaker Corp.**, Minneapolis, Minn. $2,338,830. Hertz generator sets. Mobility Equipment Command, Research & Development Center, Fort Belvoir, Va. DA AK02–67–C–0136.

—**Western Electric,** New York, N.Y. $1,226,000. Overhaul of two Nike Hercules systems. Burlington, N.C. Army Missile Command, Huntsville, Ala. DA AH01-67-A-0037.

—**Priester Construction Co.,** Davenport, Iowa. $2,108,039. Construction of a small arms test firing facility and helicopter simulator building with electrical system, parking and access road at the Rock Island Arsenal, Rock Island, Ill. Engineer Dist., Chicago, Ill. DA-CA23-68-C-0069.

—**Litton Systems,** Woodland Hills, Calif. $3,000,000. Inertial navigation sets. Electronics Command, Philadelphia, Pa. DA-AB07-68-C-0345.

8—**Rulon Co.,** Chicago, Ill. $2,369,014. Metal parts for fuzes used on artillery ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0387.

—**Barry L. Miller,** Hawthorne, Calif. $1,363,310. M13 links for 7.62mm ammunition. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0637.

—**H. Hertzberg & Son, Inc.,** Middletown, N.Y. $1,203,708. Chamber cleaning brushes for M16 rifles. Rock Island Arsenal, Rock Island, Ill. DA-AF01-68-C-0746.

9—**Western Contracting Corp.,** Sioux City, Iowa. $3,795,400. Navigation channel construction dredging on the Saginaw River in Michigan. Engineer Dist., Detroit, Mich. DA-CW35-68-C-0066.

—**General Instrument Corp.,** Chicopee, Mass. $3,386,618. 750-lb. bomb components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0246.

—**Raytheon Co.,** Lexington, Mass. $2,322,000. Metal parts for bomb nose fuzes. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0243.

—**Troup Bros.,** Coral Gables, Fla. $1,053,546. Construction of 11 miles of canal and appurtenant works in connection with the Central and Southern Florida Flood Control Project. Osceola County, Fla. Engineer Dist., Jacksonville, Fla. DA-CW17-68-C-0076.

10—**Stolte, Inc.,** Oakland, Calif. $3,073,500. Construction of officers quarters and officers dining hall at Mather AF, Calif. Engineer Dist., Sacramento, Calif. DA-CA05-68-C-0077.

—**Continental Motors Corp.,** Mobile, Ala. $2,596,820. Remanufacture and/or retrofit of multi-fuel engine assemblies for 5-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1093.

—**Allis Chalmers Mfg. Co.,** York, Pa. $2,513, 875. Design manufacture and delivery of hydraulic pump-turbines for the Carters Dam in Georgia. Engineer Dist., Mobile, Ala. DA-CW01-68-C-0098.

—**General Motors,** Detroit, Mich. $1,977,709. Generator sets. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-6220.

—**Dyson & Co.,** Pensacola, Fla. $1,842,003. Construction of a three-story armament engineering evaluation facility and construction of a one-story addition to an existing boiler house at Eglin AFB, Fla. Engineer Dist., Mobile, Ala. DA-CA01-68-C-0047.

—**American Dredging Co.,** Philadelphia, Pa. $1,452,450. Dredging in the Delaware River, Philadelphia Harbor to Londreth Range, Pa. and New Jersey. Engineer Dist., Philadelphia, Pa. DA-CW61-68-C-0235.

—**Norris Industries,** Los Angeles, Calif. $1,186,600. Repair of government owned cartridge case facilities. Army Procurement Agency, Pasadena, Calif. DA-04-495-AMC-00039 (A).

—**Bell & Howell,** Chicago, Ill. $1,185,338. Metal parts for 81mm illuminating projectile fuzes. Evanston, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0047.

—**Jones Construction Co.,** Seattle, Wash. $1,011,877. Construction of a passenger terminal and cafeteria at McChord AFB, Wash. Engineer Dist., Seattle Wash. DA-CA67-68-C-0015.

13—**Mills Mfg. Co.,** Asheville, N.C. $1,303,800. Cargo parachutes. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1889.

—**Pioneer Recovery Systems,** Manchester, Conn. $1,000,110. Cargo parachutes. Columbia, Miss. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1891.

—**Irving Air Chute Co.,** Lexington, Ky. $1,124,470. Cargo parachutes. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1888.

—**Boeing Co.,** Morton, Pa. $1,548,914. Spare parts for CH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-A-0005.

—**General Motors,** Indianapolis, Ind. $2,875,194. T63-A-5A turbo shaft engines for OH-6A aircraft. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-1333.

—**Kennedy Van Saun Corp.,** Danville, Pa. $1,357,500. Metal parts for high explosive projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0180.

—**Caterpillar Tractor Co.,** Peoria, Ill. $8,579,040. Hydraulic operated tractors. Aurora, Ill. Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-7503.

—**D&A Equipment Co.,** Pensacola, Fla. $1,252,000. Construction of an industrial treatment and disposal plant and electroplating shop. Robins AFB, Ga. Engineer Dist., Savannah, Ga. DA CA21-68-C-0061.

—**Walsh & Co.,** Anchorage, Alaska. $1,311,272. Construction of a POL operational facility and supporting facilities, a concrete maintenance building with supporting utilities and complete fire protection system for hanger protection. Shemya AFB, Alaska. Engineer Dist., Anchorage, Alaska. DA CA85-68-C-0081.

—**Johnson Bros. Highway & Heavy Constructors Co. and D. H. Blattner & Son, Inc.,** Litchfield, Minn. $4,763,935. Work on the Kaw Reservoir Project. Ponca City, Okla. Engineer Dist., Tulsa, Okla. DA CW56-68-C-0204.

—**Ashbach Construction Co.,** St. Paul, Minn. $1,798,773. Construction and excavation work on the Buffalo Bayou and Tributaries Project. Houston, Tex. Engineer Dist., Galveston, Tex. DA CW64-68-C-0115.

14—**Pacific Car & Foundry Co.,** Renton, Wash. $1,600,000. Overhaul and conversion of Government-furnished M110 artillery guns to self-propelled full tracked M107 artillery guns. Army Procurement Agency, Oakland, Calif. DA AG05-68-C-0696.

—**Stevens Mfg. Co.,** Ebensburg, Pa. $1,629,247. One-and-a-half-ton cargo trailers and one-and-a-half-ton trailer chassis (M103A3). Tank Automotive Command, Warren, Mich. DA AE07-68-C-2385.

—**List & Clark Construction Co.,** Overland Park, Kan. $1,615,169. Construction and excavation on the local flood protection project at Osawatomie, Kan. Engineer Dist., Kansas City, Kan. DA CW41-68-C-0154.

15—**Chamberlain Mfg. Co.,** Elmhurst, Ill. $4,761,700. Modernization of support activities for the 175mm and 155mm production program. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 36-034-AMC-00163 (A).

—**Ryan Aeronautical Co.,** San Diego, Calif. $1,784,463. 196 line items of repair parts in support of MQM-34D Target Missile Flight Services Program. Army Missile Command, Huntsville, Ala. DA 04-495-AMC-01105 (Z).

—**F.T.S. Corp.,** Denver, Colo. $1,736,870. Fin and nozzle assemblies for 2.75-inch rockets. Picatinny Arsenal, Dover, N.J. DA AA21-67-C-0424.

—**American Machine & Foundry Co.,** Brooklyn, N.Y. $5,559,680. Metal parts for 750-lb. bombs. Garden City, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0161.

16—**Bauer Dredging Co.,** Port Lavaca, Tex. $1,259,414. Dredging work on the Mississippi River Gulf Outlet Channel Project in Orleans and St. Bernard Parishes, La. Engineer Dist., New Orleans, La. DA CW29-68-C-0177.

—**Delaware Chlorine Products,** Kearny, N.J. $6,366,000. 30,000,000 lbs. of tetrochlorobenzene. Delaware City, Del. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0531.

—**Bendix Corp.,** Teterboro, N.J. $2,520,000. Stabilized platforms and amplifier control power supply for the Pershing missile system. Army Procurement Agency, New York, N.Y. DA AG25-68-A-0955.

—**Bell Helicopter,** Fort Worth, Tex. $5,561,418. Rotary wing blades. $10,865,000. UH-1 helicopters and TH-1 trainer helicopters, Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022 and DA AJ01-68-C-1911.

17—**TRW, Inc.,** Camden, N.J. $1,081,452. 104 electrical equipment shelters. Electronics Command, Philadelphia, Pa. DA AB05-68-C-1719.

—**Lembke Construction Co.,** Inglewood, Colo. $1,316,600. Construction of three three-story airmen's dormitories at Peterson Field, Colo. Engineer Dist., Omaha, Neb. DA CA45-68-C-0057.

—**Great Lakes Dredge & Dock Co.,** New York, N.Y. $1,370,640. Dredging work at Little Neck Bay, N.Y. Engineer Dist., New York, N.Y. DA CW51-68-C-0034.

—**Talley Industries,** Mesa, Ariz. $2,829,750. Hand grenades. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0607.

—**Ford Motors,** Highland Park, Mich. $4,749,427. Utility trucks and ambulances. General Purpose Vehicle Project Agency, Warren, Mich. DA AE06-68-C-0001.

—**Morgen & Oswood Construction Co.,** Great Falls, Mont. $1,996,205. Construction of a junior high school at Libby, Mont. Engineer Dist., Seattle, Wash. DA CW67-68-C-0063.

—**Murphy Bros.,** Spokane, Wash. $1,484,195. Construction and excavation work at the Dworshak Dam and Reservoir Project, Orofino, Idaho. Engineer Dist., Walla Walla, Wash. DA CW6-68-C-0098.

—**Metz Construction Co.,** Tucson, Ariz. $1,359,800. Construction of three 200-man dormitories at Davis-Monthan AFB, Ariz. Engineer Dist., Los Angeles, Calif. DA-CA09-68-C-0116.

—**Sletten Construction Co.,** Las Vegas, Nev. $1,782,950. Construction of four 200-man dormitories at Nellis AFB, Nev. Engineer Dist., Los Angeles, Calif. DA CA09-68-C-0115.

—**Union Carbide Corp.,** New York, N.Y. $1,310,031. Dry batteries. Charlotte, N.C. Electronics Command, Philadelphia, Pa. DA AB05-68-C-2460.

—**American Fabricated Products,** Indianapolis, Ind. $2,220,356. Fin assemblies for 81mm mortars. Army Procurement Agency, Chicago, Ill. DA AA09-68-C-0298.

—**Continental Motors,** Mobile, Ala. $3,028,472. Remanufacture and/or retrofit of replenishment spares, multi-fuel assemblies for five-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07-68-C-1093.

20—**Sanford Chemical Co.,** Port Neches, Tex. $2,768,000. Technical chemicals. Edgewood Arsenal, Edgewood, Md. DA AA15-68-C-0532.

—**Ashbach Construction Co.,** St. Paul, Minn. $4,348,170. Construction work on the Dubuque, Iowa, local flood protection project. Engineer Dist., Rock Island, Ill. DA CW25-68-C-0051.

—**R. M. Wells Co.,** Quannah, Tex. $2,281,600. Construction of an airmen's dormitory at Sheppard AFB, Tex. Engineer Dist., Albuquerque, N.M. DA CA47-68-C-0073.

—**Vatronics,** Patterson, N.J. $1,796,850. Time fuzes for aircraft flares. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0195.

—**Boeing Co.** Morton, Pa. $2,635,955. Transmission assemblies for CH-47 helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0005.

—**Raytheon Co.,** Norwood, Mass. $1,496,832. Multiplexers and running spare parts kits. North Dighton, Mass. Electronics Command, Philadelphia, Pa. DA 36-039-AMC-04878 (E).

—**Bridge Engineering Corp.,** Galveston, Tex. $1,356,460. Work on the Galveston Harbor and Channel Project. Engineer Dist., Galveston, Tex. DA CW64-68-C-0117.

—**Honeywell, Inc.,** Boston, Mass. $1,971,857. Infrared target indicators. Research & Development Laboratory, Mobility Equipment Command, Fort Belvoir, Va. DA AK02-68-C-0022.

21—**Muncie Gear Works, Inc.,** Muncie, Ind. $1,900,250. Fin and nozzle assemblies for 2.75-inch rockets. Picatinny Arsenal, Dover, N.J. DA AA21-68-C-0782.

—**Donovan Construction Co.,** New Brighton, Minn. $1,740,852. Metal parts for 155mm projectiles. Minneapolis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0044.

—**United Aircraft,** East Hartford, Conn. $3,229,050. T73-0-1 engines for CH-54A helicopters, Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1872.

—**Servidone Construction Corp.,** Castleton, N.Y. $2,931,425. Work on the Rosendale Flood Control Project. Ulster County, N.Y. Engineer Dist., New York, N.Y. DA CW51-68-C-0039.

—**Magnavox Co.,** Fort Wayne, Ind. $2,537,000. Radio sets. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0087.

—**Machlett Laboratories,** Stamford, Conn. $1,244,000. Image intensifier assemblies for the night vision program. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0697.

—**Whittaker Corp.**, Saugus, Calif. $1,613,700. MK125 igniters for 2.75-inch rocket motors. Indio, Calif. Picatinny Arsenal, Dover, N.J. DA AA21-68-C-0674.

22—**Boeing Co.**, Morton, Pa. $2,249,250. Absorber assemblies, transmission shafts and rotary wing blades. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0005.

—**Jetta Power, Inc.**, Peekskill, N.Y. $1,714,060. Gasoline engine driven generator sets. Sloatsburg, N.Y. Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-7508.

—**Columbus Milpar & Mfg. Co.**, Columbus, Ohio. $2,484,000. Fuzes for 81mm projectiles. Army Procurement Agency, New York, N.Y. DA AA09-68-C-0300.

—**White Motors, Lansing, Mich.** $5,853,803. 2½-ton trucks. General Purpose Vehicles Project Manager, Warren, Mich. DA AE07-68-C-5819.

—**Allis Chalmers Mfg. Co.**, York, Pa. $2,689,950. Design, manufacture and delivery of one Kaplan Type Turbine and one Francis Type Pump Turbine for the Clarence Cannon Dam and Reservoir Project, Salt River, Mo. Engineer Dist., St. Louis, Mo. DA CW43-68-C-0116.

—**Hall Construction Co.**, Houston, Tex. $1,512,206. Construction of flood protection levees and flood walls at the Texas City, Tex., Project. Engineer Dist., Galveston, Tex. DA CW64-68-C-0119.

—**Penland Paper Converting Corp.**, Hanover, Pa. $1,190,937 and $1,214,062. Fiber containers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0441 and DA AA09-68-C-0442.

—**Federal Container Corp.**, Memphis, Tenn. $2,520,625. Fiber containers for 105mm ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0443.

—**Motorola**, Chicago, Ill. $2,295,510. Metal parts for fuzes for artillery and mortar ammunition. Elk Grove Village, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0340.

—**Revere Copper & Brass, Inc.**, Baltimore, Md. $1,759,220. Cup cases and bullet jacket cups for 30 and 50 caliber arms. Detroit, Mich. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0533.

23—**Scovill Mfg. Co.**, Waterbury, Conn. $1,669,253. Grenade fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-67-C-0161.

—**Flinchbaugh Products, Red Lion**, Pa. $1,112,324. Metal parts for 90mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0130.

—**Brad's Machine Products**, Gadsden, Ala. $1,935,000. Metal parts for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0209.

—**General Time Corp.**, Stamford, Conn. $2,017,839. Metal parts for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0054.

—**Etowah Mfg. Co.**, Gadsden, Ala. $1,825,125. Metal parts for artillery shells. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0205.

—**HRB Singer, Inc.**, Moorestown, N.J. $3,215,500. Transmitting sets, detecting sets, maintenance floats and surveillance information centers. Electronics Command, Philadelphia, Pa. DA AB05-68-C-1215.

—**Texas Instruments**, Dallas, Tex. $4,000,000. Classified electronics equipment. Electronics Command, Fort Monmouth, N.J.

—**Ghemm Co.**, Fairbanks, Alaska. $1,125,000. Construction of dormitories and utilities, and replacement of primary power generators at Galena Airport, Alaska. Engineer Dist., Anchorage, Alaska. DA CA85-68-C-0086.

—**International Terminal Operating Co.**, New York, N.Y. $1,404,338. Services. Bayonne, N.J. Eastern Area, MTMTS, Brooklyn, N.Y. DA HC21-68-D-0102.

—**King Construction Co.**, Texarkana, Tex. $1,229,557. Construction work on the Kerr Lock and Dam Project. Sequoyah County, Okla. Engineer Dist., Tulsa, Okla. DA CW56-68-C-0222.

—**Homan General Contractors**, Lacey, Wash. $1,921,100. Construction of eight tactical equipment shops at Fort Lewis, Wash. Engineer Dist., Seattle, Wash. DA CA67-68-C-0019.

24—**Norris Industries.** Los Angeles, Calif. $2,390,367. 152mm projectiles. Army Procurement Agency, Pasadena, Calif. DA AG07-68-C-1257.

—**Eureka Williams Co.**, Bloomington, Ill. $3,666,300. 750-lb. bomb fuzes. Ammunition Procurement & Supply Agency Joliet, Ill. DA AA09-68-C-0256.

—**Triangle Electronics Mfg. Co.** Poughkeepsie, N.Y. $1,774,107. Special purpose cable assemblies, adapter cable assemblies, electrical connector plugs and preformed wire grips. Salinas, Calif. and Poughkeepsie. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0636.

—**Maremont Corp.**, Saco, Maine. $1,561,016. 7.62mm machine guns with spare barrels and bipod assemblies. Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0087.

—**Western Electric**, New York, N.Y. $1,565,000. Overhaul of electronic shop sets for Nike Hercules. Burlington, N.C. Army Missile Command, Huntsville, Ala. DA AH01-67-A-0037.

—**Marquardt Corp.**, Ogden, Utah. $3,038,945. 2.75-inch rocket fin and nozzle assemblies. Picatinny Arsenal, Dover, N.J. DA AA21-67-C-0426.

—**Kollsman Instrument Corp.**, Syosset, N.Y. $2,186,000. Night observation devices. Mobility Equipment R&D Center, Fort Belvoir, Va. DA AK02-68-C-0494.

—**Bell Helicopter**, Fort Worth, Tex. $4,236,876. UH-1 aircraft transmission assemblies. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0022.

—**Atlas Construction Co.**, Vidalia, La. $2,957,232. Construction work on the Ouachita-Black River Navigation Project. Catahoula and La Salle Parishes, La. Engineer Dist., Vicksburg, Miss. DA CW38-68-C-0149.

—**Continental Motors**, Mobile, Ala. $3,200,000. Remanufacture of replacement spares for 2½-ton trucks. Tank Automotive Command, Warren, Mich. DA AE07-68-C-2549.

—**Raytheon Co.**, Bedford, Mass. $1,198,312. Detection devices. Quincy, Mass. Picatinny Arsenal, Dover, N.J. DA AA21-68-C-0578.

27—**Atlas Chemical Industries,** Wilmington, Del. $9,019,867. Operation of facility for TNT production and for support services at the Volunteer Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00531 (A).

—**Olin Mathieson Chemical Corp.**, New York, N.Y. $31,302,750. Operation of a facility for production of propellant, bags, liners, miscellaneous ammunition components, and for support service at the Indiana Army Ammunition Plant, Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00097 (A).

—**Olin Mathieson Chemical Corp.**, New York, N.Y. $22,022,846. Operation of a plant for production of various propellants and support activities at the Badger Army Ammunition Plant, Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00106 (A).

—**Chamberlain Mfg. Corp.**, Elmhurst, Ill. $1,892,407. Metal parts for 4.2-inch illuminating projectiles. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0036.

—**Texas Instruments, Inc.**, Dallas, Tex. $3,139,132. Infrared detecting sets. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0167.

—**ITEK Corp.**, Lexington, Mass. $2,505,141. Stabalized night sights. Burlington, Mass. Mobility Equipment R&D Center, Fort Belvoir, Va. DA AK02-68-C-0491.

—**AVCO Corp.**, Stamford, Conn. $16,724,514. T55-L-11 turbine engines for CH-47C aircraft. Aviation Materiel Command, St. Louis, Mo.

—**Miller Contracting Co.**, Long Beach, Calif. $1,954,950. Construction work on the Los Angeles County Drainage Area, San Gabriel River Channel Project. Irwindale, Calif. Engineer Dist., Los Angeles, Calif. DA CW09-68-C-0047.

—**Construction, Ltd.**, Bordentown, N.J. $1,098,873. Construction of a three-story barracks with a one-story mess hall wing at Fort Belvoir, Va. Engineer Dist., Norfolk, Va. DA CA65-68-C-0173.

—**Bell Helicopter**, Fort Worth, Tex. $2,000,000. Maintenance and repair parts, and support equipment for OH-58A helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-A-0118.

—**Page Communication Engineers**, Washington, D.C. $1,453,000. Engineering services and equipment for integrated wide band communications systems in Vietnam. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0372.

28—**Cutler-Hammer, Inc.**, Deer Park, N.Y. $2,676,613. Radar sets and ancillary items. Electronics Command, Fort Monmouth, N.J. DA 28-043-AMC-02158 (E).

—**Chamberlain Mfg. Corp.**, Elmhurst, Ill. $2,433,784. $2,693,876. Metal parts for 81mm projectiles. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00803 (A). DA 11-173-AMC-00803 (A).

—**United Aircraft**, East Hartford, Conn. $6,468,800. Spare T73-P-1 engines. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1872.

—**Dawson Bridge Co.**, Bloomfield, Ky. $1,629,811. Construction work on the Cove Run Reservoir Project. Morehead, Ky. Engineer Dist., Louisville, Ky. DA CW27-68-C-0168.

—**Forsberg & Gregory**, Redlands, Calif. $1,673,560. Construction of three 200-man and one 133-man airmen's dormitories at Norton AFB, Calif. Engineer Dist., Los Angeles, Calif. DA CA09-68-C-0120.

—**Raytheon Co.**, Andover, Mass. $1,352,000. Refurbishing Hawk battery sets for the Marine Corps. Army Missile Command, Huntsville, Ala. DA AH01-68-A-0037.

29—**Bell Aerospace Corp.**, Fort Worth, Tex. $15,500,000. AH-1J helicopters. Hurst, Tex. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-1928.

—**General Motors.** Indianapolis, Ind. $1,126,233. Rebuilding/retrofit of CD 850 transmissions for the M48 combat tank. Tank Automotive Command, Warren, Mich. DA 20-113-AMC-12016 (T).

—**Sundt Construction Co., Tucson, Ariz.** $3,885,525. Construction of an operational training and evaluation facility; an operational readiness unit; engineer operation building and modifying five existing buildings. Vandenberg AFB, Calif. Engineer Dist., Los Angeles, Calif. DA CA09-68-C-0121.

—**IT&T Corp.**, Nutley, N.J. $23,677,395. Radio sets and antenna alignment indicators. Clifton, N.J. Electronics Command, Philadelphia, Pa. DA AB05-68-C-0027.

—**AVCO Corp.**, Stratford, Conn. $11,319,474. Gas turbine engines. Aviation Materiel Command, St. Louis, Mo. DA AJ01-68-C-0954.

31—**Farmers Chemical Assn.**, Tyner, Tenn. $2,770,445. Production of chemicals, maintenance and support services at the Volunteer Army Ammuniction Plant. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00300 (A).

—**Norris Industries,** Los Angeles, Calif. $16,282,943. Metal parts for 81mm projectiles and 105mm cartridge cases. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0304.

—**Mason & Hanger—Silas Mason Co.**, New York, N.Y. $27,869,269. Operation of the Army Ammunition Plant, Burlington, Iowa, and for loading, assembling and packing medium and large caliber ammunition and components. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00085 (A).

—**Holston Defense Corp.**, Kingsport, Tenn. $10,797,636. Operation of the Holston Army Ammunition Plant, Kingsport, Tenn., and for manufacture of various explosives and support services. Ammunition Procurement & Supply Agency, Joliet, Ill. W-11-173-AMC-00035 (A).

—**Harvey Aluminum Sales**, Torrance, Calif. $14,608,985. Loading, assembling and packing medium caliber ammunition and components; and maintenance and support services at the Army Ammunition Plant, Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA 11-173-AMC-00520 (A).

—**Honeywell, Inc.**, Hopkins, Minn. $1,535,100. $1,387,500. Metal parts for bomb fuzes and fuzes for grenades. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0202. DA AA09-68-C-0255.

—**Chrysler Corp.**, Highland Park, Mich. $4,470,320. Metal parts for 175mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA09-68-C-0006.

—**Pace Corp.**, Memphis, Tenn. $1,390,194. Surface flares. Camden, Ark. Picatinny Arsenal, Dover, N.J. DA AA21-68-C-0497.

—**Chrysler Corp.**, Centerline, Mich. $7,300,898. Engineering services for the M60 tank. DA AE07-67-C-5044.

—**Hunter Outdoor Products,** Long Island City, N.Y. $1,638,063. Collapsable tank assemblies for storage of petroleum products.

Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-7684.

—**Lockheed Electronics,** Plainfield, N.J. $3,406,899. Shop sets with antennae, test panel, documentation and related spare subassemblies. Metuchen, N.J. Frankford Arsenal, Philadelphia, Pa. DA AA25-68-C-0669.

—**Sperry Rand,** Phoenix, Ariz. $3,782,222. Gyro-magnetic compass sets. Army Procurement Agency, Los Angeles, Calif. DA AG07-68-C-6187.

—**Magnavox Co.,** Fort Wayne, Ind. $3,748,800. Radio sets. Electronics Command, Fort Monmouth, N.J. F-34-601-68-A-1489.

—**Varo, Inc.,** Garland, Tex. $1,346,700. Searchlights. Electronics Command, Fort Monmouth, N.J. DA AB07-68-C-0291.

—**PRD Electronics,** Westbury, N.Y. $2,233,551. Microwave sets. Army Missile Command, Huntsville, Ala. DA AH01-68-C-1992.

—**Rubber Fabricators,** Grantsville, W. Va. $4,762,040. Pneumatic. 12-ton capacity pontoon floats. Grantsville, Union, and Richwood, W.Va. Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-7819.

—**Uni-Royal,** Providence, R.I. $4,669,577. Twelve-ton capacity pontoon floats, Mobility Equipment Command, St. Louis, Mo. DA AK01-68-C-7820.

—**Food Machinery Corp.,** Santa Clara, Calif. $3,827,190. 4.2-inch high explosive projectiles. Army Procurement Agency, Oakland, Calif. DA AG05-68-C-0058.

—**Lockwood Construction Co.** and **Modern Construction Co.,** Santa Fe, N.M. $1,551,892. Construction of three pre-fab metal maintenance docks at Cannon AFB, N.M. Engineer Dist., Albuquerque, N.M. DA CA-47-C-0078.

—**Martin Eby Construction Co.,** Wichita, Kan. $14,120,734. Construction of barracks at Fort Leonard Wood, Mo. Engineer Dist., Kansas City, Mo. DA CA41-68-C-0040.

—**Roberts Corp.,** Albuquerque, N.M. $1,007,344. Construction of a Celestial Guidance Lab including mechanical building and tunnels, and a Centrifuge Support Facility. Engineer Dist., Albuquerque, N.M. DA CA47-68-C-0068.

—**Bowen-McLaughlin-York Co.,** York, Pa. $4,681,643. Retrofit of M48A1 tanks to M48A3 tank configuration. Army Weapons Command, Rock Island, Ill. DA AF03-67-C-0076.

—**Street Construction Co.,** Charlotte, N.C. $1,344,800. Construction of a 600-man airmen's dormitory with support facilities at Pope AFB, N.C. Engineer Dist., Savannah, Ga.

DEPARTMENT OF THE NAVY

1—**Boeing Co.,** Morton, Pa. $62,812,227. CH-46D helicopter. Naval Air Systems Command. N00019-68-C-0391.

—**PRD Electronics,** Westbury, N.Y. $2,358,013. Versatile-Avionics-Shop Test Equipment (VAST) systems and associated equipment. Naval Air Systems Command. N00019-67-C-0484.

—**Ries Construction Co.,** San Diego, Calif. $2,324,444. Construction of barracks at the Naval Amphibious Base, Coronado, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473-67-C-3011.

—**McDonnell Douglas Corp.,** St. Louis, Mo. $1,507,816. Updating of Navy and Air Force F-4 aircraft drawings to reflect present configuration. Naval Air Systems Command. N00019-67-C-0171.

—**Stromberg Carlson,** San Diego, Calif. $1,485,890. Tactical display systems. Naval Air Systems Command. N00019-68-C-0253.

2—**Western Electric,** New York, N.Y. $9,519,400. Classified work. Naval Electronic Systems Command. N00039-68-C-3605.

—**Southern Shipbuilding Corp.,** Slidell, La. $2,780,000. Construction of four large harbor tugs (YTB). Naval Ship Systems Command. N00024-68-C-0324.

—**Jordon Co.,** Suisan City, Calif. $1,669,249. Construction of barracks at the Naval Air Station, North Island, San Diego, Calif. Naval Facilities Engineering Command. N62473-67-C-3015.

3—**McDonnell Douglas Co.,** St. Louis, Mo. $10,260,000. Long lead time effort for F-4J, RF-4B, F-4E and RF-4C aircraft for FY 1969; and a $49,200,000 modification for additional funding for long lead time effort for F-4D/E and RF-4C aircraft for FY 1968. Naval Air Systems Command. N00019-67-C-0171.

—**Bunker Ramo Corp.,** Silver Spring, Md. $4,496,180. Work on electronic countermeasure equipment. Naval Air Systems Command. N00019-68-C-0210.

—**Hoffman Electronics,** El Monte, Calif. $2,596,987. Radio navigation tests sets for SH-3D, F-8 and F-9 aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-4568.

—**Hughes Aircraft,** Culver City, Calif. $1,736,220. Incremental funding for Phoenix missile system. Naval Air Systems Command. NOw 63-0379.

—**North American Rockwell Corp.,** Columbus, Ohio. $1,380,000. Design, development, fabrication, test and to furnish a naval intelligence processing system. Naval Air Systems Command. N00019-68-C-0525.

—**Harders Construction Co.,** Panama City, Fla. $1,087,500. Widening of pier 314 at the U.S. Naval Shipyard, Charleston, S.C. Naval Facilities Engineering Command.

6—**Grumman Aircraft Engineering Corp.,** Bethpage, N.Y. $54,600,000. A-6A aircraft. Naval Air Systems Command. N00019-68-C-0106.

—**Shepard Labs,** Summit, N.J. $1,972,280. Medium speed printers. Naval Electronic Systems Command. N00039-68-C-0541.

—**Maxson Electronics Corp.,** Macon, Ga. $1,809,376. MK 31, MOD 2 fuzes for 5"/54 ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5349.

—**Treadwell Corp.,** New York, N.Y. $1,774,620. Seven submarine oxygen generators and related technical data with extended engineering services. Bronx, N.Y. Naval Ship Systems Command. N00024-68-C-5212.

—**Santa Barbara Research Center,** Soleta, Calif. $1,514,475. Optical assembly components for MK 91 and MK 92 fuzes used with 3- and 5-inch projectiles. Naval Ammunition Depot, Crane, Ind. N00164-68-C-0389.

7—**LTV Aerospace Corp.,** Dallas, Tex. $153,278,473. A-7E aircraft. Naval Air Systems Command. N0019-68-C-0075.

—**Canadian Commercial Corp.,** Ottawa, Ontario, Canada. $4,029,690. Torpedo tubes and ejection pumps used on submarines. Montreal, Canada. Naval Supply Center, Oakland, Calif. N00228-68-C-26-31.

—**Royal Industries,** Santa Ana, Calif. $1,799,377. External auxiliary 600-gallon fuel tanks. Alhambra, Calif. Naval Air Systems Command. N00019-68-C-0090.

—**North American Aviation,** McGregor, Tex. $1,460,983. Rocket motors. Naval Air Systems Command. N00019-67-C-0633.

—**Northrop Corp.,** Newbury Park, Calif. $1,071,960. MQM-74A target drones. Naval Air Systems Command. N00019-67-C-0456.

8—**Columbus Milpar & Mfg. Co.,** Columbus, Ohio. $7,428,640. MK 15, MOD 1 bomb fins for use in the assembly of MK 82 bombs. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5364.

—**Automatic Sprinkler Corp.,** Lancaster, N.Y. $4,410,000. Design, analysis, development, construction, test and furnishing of developmental models and 10 service test models of a swimmer lift support system. Naval Ship Systems Command. N00024-68-C-5303.

—**Talley Industries,** Mesa, Ariz. $1,461,955. MAU-9A/A ejector bomb racks. Naval Air Systems Command. N00019-68-C-0496.

—**Magnavox Co.,** Fort Wayne, Ind. $1,350,628. Classified electronic equipment. Naval Air Systems Command. N00019-68-C-0434.

9—**Honeywell, Inc.,** North Hopkins, Minn. $25,750,000. Additional production of MK 46, MOD 1 torpedo main assembly and related equipment. Naval Ordnance Systems Command. N00017-68-C-1306, Mod. P002 8-0252-310.

—**Del Webb Corp.,** Phoenix, Ariz. $11,804,372. Construction of family housing units at Naval Air Station, Alameda Calif., and Naval Station, Treasure Island, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBy-64300.

—**Newport News Shipbuilding & Drydock Co.,** Newport News, Va. $2,500,000. Work in connection with the design of a nuclear propulsion plant for an attack-type submarine. Naval Ship Systems Command. N0024-68-C-0330.

—**United Aircraft,** Stratford, Conn. $2,375,000. Airframe parts for CH-53A helicopters. Aviation Supply Office, Philadelphia, Pa. N00383-8-8105-A-AB411-MOD 1.

—**General Electric,** Utica, N.Y. $1,222,227. Increase in the limitation of authorization for guidance and control groups for Chaparral guided missiles. Naval Air Systems Command. N00019-68-C-0322.

10—**General Precision Systems,** Binghampton, N.Y. $12,487,965. Additional units of the F-4E weapon system training set. Sunnyvale, Calif. Naval Training Device Center, Orlando, Fla. N61339-66-C-0090.

—**General Motors,** Indianapolis, Ind. $2,520,982. Modification parts for T56-A7/8/10W engines for C-2A, E-2A, C-130 and P-3A aircraft. Aviation Supply Office, Philadelphia, Pa. F34601-68-C-0523-GB10.

—**Consolidated Diesel Electric Co.,** Old Greenwich, Conn. $1,914,044. MC-2A mobile electric power plants used to power aircraft aboard aircraft carriers. Navy Purchasing Office, Washington, D.C. N00600-68-C-1143.

—**Paul J. Vagnoni,** North Hills, Pa. $1,360,000. Construction of enlisted men's barracks at the Naval Station, Philadelphia, Pa. East Central Div., Naval Facilities Engineering Command, Philadelphia, Pa.

—**Dayton Aviation Radio & Equipment Corp.,** Troy, Ohio. $1,169,060. Airborne VHF communication/navigation systems used on P-3C aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-C-3360.

13—**Raytheon Co.,** Bedford, Mass. $5,207,028. Design and development on Sparrow III missiles. Naval Air Systems Command. N00019-67-C-0019.

—**General Electric,** Schenectady, N.Y. $1,500,000. Nuclear propulsion R&D. Naval Ship Systems Command. N00024-67-C-5016.

—**American Machine & Foundry Co.,** York, Pa. $1,132,193. MK II, MOD O and MK II, MOD 1, 81mm mortars and 50-cal. machine gun cradle adjuster kits. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00-104-68-C-3368.

14—**IBM Corp.,** Oswego, N.Y. $3,724,027. Design, development and fabrication of an airborne anti-submarine warfare computer and support equipment for use in project A-NEW (ASW Integrated Avionics System). Naval Air Development Center, Johnsonville, Pa. N62269-68-C-0379.

—**Hughes Aircraft,** Fullerton, Calif. $1,744,966. Naval Tactical Data System display equipment, repair parts and technical data. . Naval Ship Systems Command. N00024-68-C-1244.

—**Newport News Shipbuilding & Dry Dock Co.,** Newport News, Va. $1,600,000. Work and services on the nuclear powered ballistic missile submarine USS Woodrow Wilson (SSBN-624). Naval Ship Systems Command. N00024-68-C-0333.

15—**Newport News Shipbuilding & Drydock Co.,** Newport News, Va. $106,300,000. Design and construction of the nuclear powered attack aircraft carrier USS Nimitz (CVAN-68). Naval Ship Systems Command. N00024-67-C-0325.

—**General Dynamics,** Pomona, Calif. $13,885,000. Additional funding for the Standard Arm missile system. Naval Air Systems Command. N00019-68-C-0074.

—**Dillingham Corp.,** Honolulu, Hawaii. $7,437,245. Modernization of five ocean minesweepers. Naval Ship Systems Command. N655202-68-C-0001 J.O. 0019.

—**Magnaxov Co.,** Fort Wayne, Ind. $2,453,831. Spare parts for AN/APQ-124 doppler and ranging radar system for F-8J aircraft. Aviation Supply Office, Philadelphia, Pa. N00383-68-A-6801-0076.

—**Jordan Co.,** Suisan City, Calif. $2,243,949. Construction of two 500-man barracks buildings at the Naval Schools Command, San Francisco Bay Naval Shipyard, Vallejo, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBy-85464.

—**Cameron Iron Works,** Houston, Tex. $2,255,538. MK 12 guided missile boosters for the Terrier missile system. Naval Ordnance Station, Indian Head, Md. N00174-68-C-0575.

16—**G. L. Cory, Inc.,** San Diego, Calif. $2,412,346. Construction of an aircraft maintenance hanger at the Naval Air Station, Miramar, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command, San Diego, Calif. N62473-67-C-3013.

—**American Mfg. Co. of Tex.,** Fort Worth, Tex. $1,924,002. MK 24 warheads used with 5-inch Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-5363.

—**General Precision Systems,** Glendale, Calif. $1,914,000. Production of modification

kits for MK 48 torpedo fire control systems. Naval Ordnance Systems Command. N00017–68–C–1218.

17—**Raymond Engineering,** Middletown, Conn. $5,910,900. MK 346, MOD 9, bomb fuzes. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–68–C–5368.

—**Sperry Rand Corp.,** Charlottesville, Va. $1,127,202. Plotting systems, repair parts, related engineering services and associated technical data. Naval Ship Systems Command. N00024–68–C–5218.

20—**North American Rockwell Corp.,** Columbus, Ohio. $3,000,000. T-2B aircraft. Naval Air Systems Command. NOw (A) 66–0081.

—**Polaron Products,** New Rochelle, N.Y. $4,662,606. MK 82, MOD 1, conical fin assemblies for 500-lb. bombs. Batesville, Miss. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–68–C–5381.

—**General Dynamics,** Pomona, Calif. $1,653,700. Research and development on the Standard Arm missile. Naval Air Systems Command. N00019–68–C–0400.

—**Magnavox Co.,** Fort Wayne, Ind. $1,281,734. Airborne detecting transmitting sets and ancillary items. Naval Air Systems Command. N00019–67–C–0678.

21—**General Electric,** Schenectady, N.Y. $20,000,000. Design and to furnish nuclear propulsion components. Naval Ship Systems Command. N00024–67–C–5321 Mod. 7.

—**Bendix Corp.,** Baltimore, Md. $3,411,028. Airborne receiver transmitters and associated equipment. Naval Air Systems Command. NOw 66–0637.

—**Kilgore Corp.,** Toone, Tenn. $2,415,600. MK 24, MOD 4, parachute flares. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–68–C–5380.

—**Concrete Pavers,** Tampa, Fla. $1,725,500. Construction of an aircraft parking apron at the Marine Corps Air Facility, Jacksonville, N.C. Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. NBy–88296.

22—**United Aircraft,** Hartford, Conn. $7,213,101. Increased funding for J52–P–8A engines. Naval Air Systems Command. N00019–67–C–0182.

—**Sperry Rand,** St. Paul, Minn. $4,400,000. Avionics computers. Naval Air Systems Command. N00019–68–C–0255.

—**Collins Radio Co.,** Richardson, Tex. $3,334,119. Airborne VLF communications systems and related equipment. Naval Air Systems Command. N00019–67–C–0382.

—**Westinghouse Electric,** Baltimore, Md. $2,187,500. Radar sets for F–4D aircraft. Naval Air Systems Command. N00019–67–C–0462.

—**Planning Research Corp.,** Los Angeles, Calif. $1,843,683. Programming and program analysis in support of the message processing and distribution systems for CVA(N) 68. San Diego, Calif. Navy Purchasing Office, Los Angeles, Calif.

—**Fred A. Arnold, Inc.,** Los Angeles, Calif. $1,701,339. Construction of 100 housing units at the Naval Air Station, Lemoore, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NBy–91701.

—**Ingersoll Products,** Chicago, Ill. $6,044,714. MK 81, MOD 1, bomb bodies for 250-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–68–C–3418.

23—**Goodyear Aerospace Corp.,** Akron, Ohio. $15,379,761. Subroc missiles. Naval Ordnance Systems Command. N00017–68–C–1408.

—**Arntz Bros.,** San Rafael, Calif. $1,248,700. Construction of a maintenance dock for large aircraft at Travis AFB, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif.

24—**LTV Aerospace Corp.,** Dallas, Tex. $5,065,527. Increased funding to extend the service life of RF–8A aircraft. Naval Air Systems Command. N00019–67–C–0146.

—**General Dynamics,** Pomona, Calif. $3,425,227. Standard Arm missile research and development. Naval Air Systems Command. N00019–67–C–0079.

—**Magnavox Research Labs,** Fort Wayne, Ind. $1,781,000. Production of equipment for a classified communications system. Torrance, Calif. Naval Electronic Systems Command. N00039–68–C–1567.

—**McDonnell Douglas Corp.,** Long Beach, Calif. $1,530,000. Long lead time effort and materials to support FY 1969 procurement of TA–4F aircraft. Naval Air Systems Command. N00019–67–C–0170.

27—**General Electric,** Utica, N.Y. $5,600,000. Airborne data processing systems. Naval Air Systems Command. N00019–68–C–0254.

—**Sundstrand Corp.,** Rockford, Ill. $1,983,460. Constant speed drives and frequency control boxes for FY 1968 F–4 program. Naval Air Systems Command. N00019–68–C–0083.

—**O. J. Beck & Sons,** Corpus Christi, Tex. $1,158,118. Construction of barracks at the Naval Air Station, Corpus Christi. Naval Facilities Engineering Command. NBy–95181.

29—**Teledyne Systems,** Hawthorne, Calif. $7,152,160. Self-contained navigation systems. Naval Air Systems Command. N00019–67–C–0189.

—**Star Iron & Steel Co.,** Tacoma, Wash. $6,409,400. Construction of four 100-ton floating cranes. Midwest Div., Naval Facilities Engineering Command, Great Lakes, Ill.

—**Straightline Mfg. Co.,** Cornwell Heights, Pa. $4,659,432. MK 82, MOD 1, conical bomb fin assemblies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104–68–C–5394.

—**Construction Ltd.,** Bordentown, N.J. $1,227,350. Construction of barracks at the Naval Air Station, Lakehurst, N.J. Naval Facilities Engineering Command. NBy 89454.

31—**Raytheon Co.,** Lexington, Mass. $9,477,990. Sparrow III missiles. Lowell, Mass. Naval Air Systems Command. N00019–68–C–0225.

—**McDonnell-Douglas Corp.,** Long Beach, Calif. $4,287,668. Multiple and triple ejector racks and related equipment. Torrance, Calif. Naval Air Systems Command. N00019–67–C–0550.

DEPARTMENT OF THE AIR FORCE

1—**Lockheed Aircraft,** Marietta, Ga. $1,267,294. Specialized engineering services for the C–130 fatigue analysis program. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–C–1335.

—**Hughes Aircraft,** Los Angeles, Calif. $1,964,882. Spare parts in support of airborne electronic equipment. El Segunda, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 33(657)–13402.

3—**General Dynamics,** Fort Worth, Tex. $7,188,188. Inspection and repair of B–58 aircraft. Waco, Tex. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–68–C–0022 P011.

—**Radiation Service Co.,** Melbourne, Fla. $3,316,328. Operation, maintenance and repair of the ballistic missile re-entry data processing system at Holloman AFB, N.M. Air Force Missile Development Center, (AFSC), Holloman AFB, N.M.

—**General Electric,** West Lynn, Mass. $1,417,817. Manufacture of spare parts for T–64 aircraft engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F33657–67–C–0054.

—**AVCO Corp.,** Cincinnati, Ohio. $4,403,836. Production of high frequency radio sets and related equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF33 (657)–15403.

6—**General Electric,** Cincinnati, Ohio. $5,428,000. J–79 jet engines. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio, F33657–68–CA–0039.

—**General Electric,** West Lynn, Mass. $2,928,000. T–64 turboshaft engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0458.

—**Hurhes Aircraft,** Los Angeles, Calif. $1,131,283. Production of spare parts for electronic countermeasure pods. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 33 (657)–13402–POOD–44.

7—**Fairchild Hiller Corp.,** Farmingdale, N.Y. $4,260,425. Modification and flight testing of the F–105 weapons delivery system; and $1,200,000 in a second contract for modification of the F–105 flight control and navigation system. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F04606–68–C–1055 and F04606–68–C–1056.

—**Electronic Communications,** St. Petersburg, Fla. $1,130,432. Production of communications equipment for EC–135 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

8—**General Electric,** West Lynn, Mass. $4,700,000. Engineering development work on the T–58 aircraft engine. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0730.

—**General Electric,** Syracuse, N.Y. $1,587,850. Manufacture of radar antennae. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34601–67–A–1470.

9—**Aerojet-General Corp.,** Sacramento, Calif. $1,922,000. Pre-production work for future production of Stage II Minuteman missile motors. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701–68–C–0189.

10—**Boeing Co.,** Wichita, Kan. $1,467,487. Production of electrical generator kits for modification of B–52 aircraft and ground support equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–68–C–3680.

14—**General Supnly Corp.,** Limestone, Maine. $1,039,877. Repair of base housing at Loring AFB, Maine. Procurement Div., Loring AFB, Maine. F17600–68–C–0105.

—**Hycon Mfg. Co.,** Monrovia, Calif. $1,723,610. Production of aircraft cameras. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0194.

—**Lockheed Aircraft,** Marietta, Ga. $2,150,000. Application of boron composite material to the leading edge wing slat of the C–5A aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–0900.

15—**Fairchild Hiller Corp.,** Hagerstown, Md. $1,631,222. Modifications to C–123 aircraft. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. F09603–68–C–0657.

16—**Sundstrand Corp.,** Rockford, Ill. $3,703,074. Production of aircraft constant speed drives and gear boxes. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601–68–A–2298–0050.

17—**General Motors,** Indianapolis, Ind. $4,992,223. A program to improve T–56 engine components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F3365768–C–0356.

20—**Kentron Hawaii, Ltd.,** Honolulu, Hawaii. $1,909,360. Management and operation of the down-range station on Eniwetok Atoll, Marshall Islands. Air Force Western Test Range, Vandenberg AFB, Calif. F04697–68–C–0002.

21—**North American Rockwell Corp.,** Anaheim, Calif. $8,244,651. Production of fire control systems for Italian-produced F–104 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–67–C–1384.

—**Litton Systems,** Woodland Hills, Calif. $1,313,002. RC–135 navigational instruments. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04606–68–A–0147.

—**Sargent Fletcher Co.,** El Monte, Calif. $1,852,861. Production of fuel tank assemblies for F–4 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. F04606–68–A–0108–QP10.

22—**Fairchild Hiller,** Farmingdale, N.Y. $1,080,800. Installation of emergency flight control system kits for F–105 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34601–67–A–3070.

—**McDonnell Douglas Corp.,** Long Beach, Calif. $1,680,242. Production of bomb release mechanisms for F–111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657–68–C–1247.

24—**Hallicrafter Co.,** Rolling Meadows, Ill. $1,330,000. Research and laboratory experimentation for the improvement of electronic components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33615–68–C–1623.

27—**Chicago Aerial Industries,** Barrington, Ill. $1,559,138. Airborne electronic optical reconnaissance systems. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. 33615–68–C–1556.

—**ITEK Corp.,** Lincoln, Neb. $1,146,060. Repair and modification of T–39 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. 04606–68–C–1016.

—**Honeywell, Inc.,** St. Petersburg, Fla. $1,423,124. Development of an aircraft navigation subsystem. Minneapolis, Minn. Air Force Missile Development Center, Holloman AFB, N.M. F29600–68–C–0024.

28—**Chromalloy American Corp.,** San Antonio, Tex. $2,299,094. Repair of jet engine compresser blades. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608–68–D–1617.

29—**General Electric,** Syracuse, N.Y. $1,013,474. Production of modification kits for aircraft radar systems. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. F34601-68-A-2094.

—**General Electric,** West Lynn, Mass. $2,579,350. Production of aircraft oxygen equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1076.

—**Lenkurt Electric Co.,** San Carlos, Calif. $1,011,000. Production of communications equipment. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F04606-68-A-0247.

—**Houston Photo Products,** Yuma, Ariz. $1,747,762. Production of a film processing laboratory. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F42600-68-C-3414.

—**Texas Instruments,** Dallas, Tex. $1,500,000. Aircraft ordnance equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-1121.

—The following contracts for international airlift passenger and cargo service during FY 1969 have been awarded by the Military Airlift Command:

Pan American. $40,286,000.
Flying Tiger Line. $27,283,000.
World Airways. $27,048,000.
Continental Air Lines. $23,713,000.
Braniff International. $22,970,000.
Seaboard World Airlines. $20,217,000.
Trans-World Airlines. $19,439,000.
Northwest Orient Airlines. $17,974,000.
Airlift International. $14,080,000.
United Airlines. $13,455,000.
Trans-International. $13,073.000.
Trans-Caribbean Airways. $12,342,000.
Capitol International. $10,979,000.
Saturn Airways. $5,601,000.
Eastern Airlines. $4,756,000.
Overseas National Airways. $4,436,000.
Universal Airlines. $3,127,000.
Southern Air Transport. $2,415,000.
American Flyers. $1,806,000.

31—**North American Rockwell Corp.,** Anaheim, Calif. $124,430,840. Research and development for the post boost propulsion sub-system of Minuteman III missiles. Space & Missile System Organization, (AFSC), Los Angeles, Calif. F04701-68-C-0040.

—**Lockheed Missiles & Space Co.,** Sunnyvale, Calif. $1,174,000. Launch services at the Eastern Test Range. Air Force Systems Command. F04701-68-C-0144.

—**Sante Fe Engineers,** Lancaster, Calif. $1,829,871. Construction of a re-entry system assembly building for Minuteman III. Minot AFB, N.D. Ballistic Missile Construction Agency, Army Corps of Engineers. DA CA13-68-C-0003.

Industrial College Schedules National Security Seminars

The Industrial College of the Armed Forces, located in Washington, D.C., will conduct a series of National Security Seminars in seven cities throughout the United States during the 1968-1969 academic year.

Seminars are open to reserve officers of the Army, Navy, Air Force, Marine Corps, National Guard and Coast Guard. Industrial representatives and other interested civilians are also invited to attend.

Reservists may apply for enrollment through official military channels. Interested civilians may enroll through the Chamber of Commerce in any of the selected cities.

Each seminar consists of 33 illustrated talks, supplemented by films and a question-answer forum. The curriculum includes such subjects as World Industrial Development, Defense Management, Exploration of Space, Civil Defense and Industrial Readiness, International Economics and many others.

The Seminar schedule is: Provo, Utah, Oct. 14-25, 1968; Sioux Falls, S.D., Nov. 11-22, 1968; Battle Creek, Mich., Jan. 6-17, 1969; San Diego, Calif., Feb. 3-14, 1969; Dallas, Tex., March 3-14, 1969; West Palm Beach, Fla., April 14-25, 1969; and Columbia, S.C., May 5-16, 1969.

Radioisotope Heat Source May Improve Guidance System

It may soon be possible to reduce aircraft guidance system errors caused by temperature changes through use of a thermal preconditioning unit, now being developed jointly by the Air Force and the Atomic Energy Commission.

Testing is now under way at Wright-Patterson AFB, Ohio, by the Aeronautical Systems Division of the Air Force Systems Command to determine the efficiency of using a radioisotope heat source to keep guidance systems at or near the proper operating temperature.

Most systems now in use employ heaters to warm the sensors, which must be kept at precise temperatures to obtain adequate performance. But the time required for the sensors to be brought to proper operating temeratures has been too long in the past.

The Promethium-147 fueled thermal preconditioner, as the new radioisotope heat unit is called, will reduce the warm-up time by maintaining the entire inertial measuring unit near the operating temperature of the sensors.

A continuous temperature control unit has not been practical in the past because continuous electrical power could not be provided, and sources of portable power were not adequate to supply the heating requirements of a large inertial system.

Since the size of inertial systems has been decreased, operating temperatures can be maintained with less than 65 watts of thermal power, even at low temperatures.

The Promethium-147 heat source was designed and developed by the Atomic Energy Commission at the request of DOD. These units are being integrated and ground tested at Wright-Patterson laboratories at temperatures as low as 65 degrees below zero. Flight tests of the unit will be made at Holloman AFB, N.M.

Captain Donald G. DePree of the Office of the Deputy for Engineering, Aeronautical Systems Division, is project officer for the heat source unit.

Navy Publishes Business Guide

The Navy Ship's Store Office has published a 20-page brochure, "A Guide for Doing Business with the Navy Resale System," to advise large and small manufacturers or prime suppliers.

The brochure discusses business procedures involving the four programs of the Navy Resale System including navy exchanges, commissary stores, military sea transportation service exchanges, and ship's stores afloat.

A list of Navy Resale System outlets around the world is also included.

Copies of the booklet can be obtained from Public Affairs Office, Navy Ship's Store Office, Third Ave. and 29th St., Brooklyn, N.Y. 11232.

Flight Actuators Meet Gunfire Tests

The Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio, has begun a program to determine how badly aircraft flight control actuators are damaged by small arms gunfire.

During the next year, actuators donated by 11 vendors will undergo impact testing by .30 and .50 caliber armor-piercing and incendiary projectiles.

According to F. R. Taylor, program manager, test data could be used to improve actuator design and develop better hydraulic fluids, armor plating and projectile deflectors. Test results will be made available to government and industrial organizations.

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